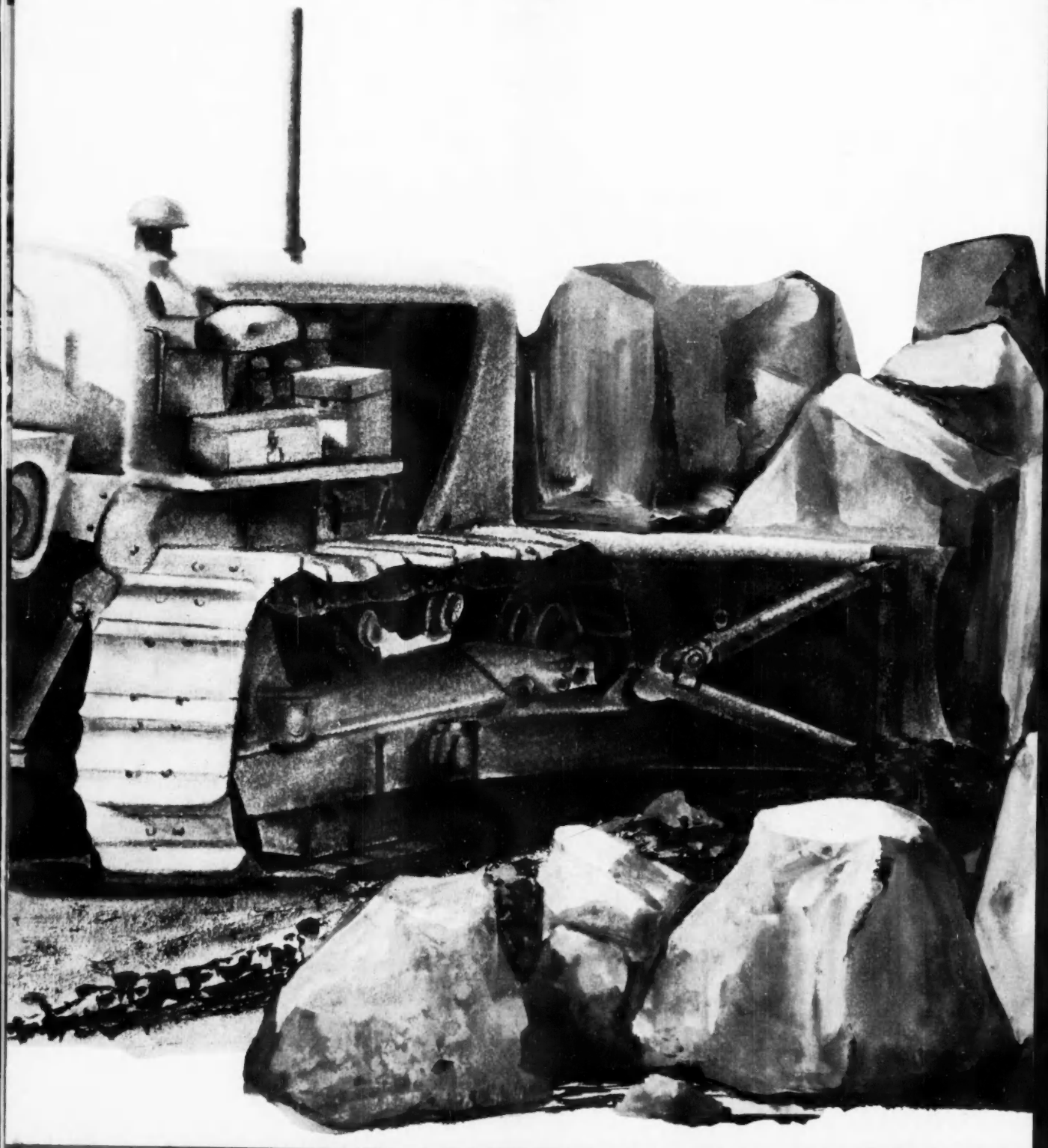
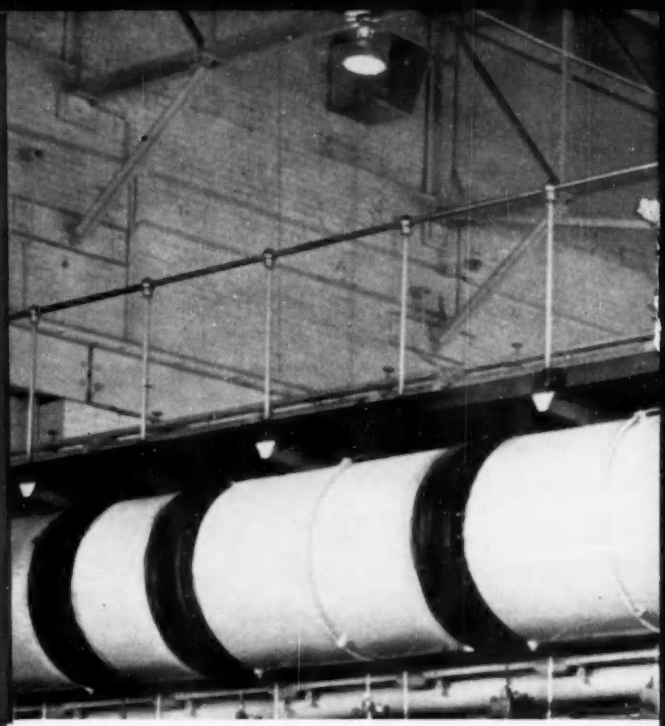
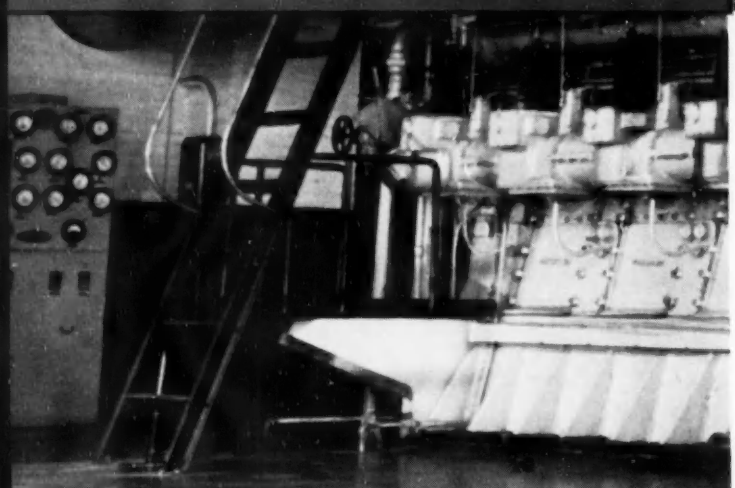
diesel power

MAY 1954



LOWER COST POWER





HERE'S HOW you can reduce your diesel maintenance costs and cut your fuel consumption: Lubricate with one of the famous *Texaco Ursa Oil* series—the one that's exactly right for your engines and operating conditions.

The *Texaco Ursa Oil* series is a complete line of lubricating oils especially refined to make diesel, gas and dual-fuel engines deliver *more power* with *less fuel* over *longer periods* between overhauls.

Best evidence that Texaco delivers these benefits is this fact —

> *For over 20 years, more stationary diesel horsepower in the U. S. has been lubricated with Texaco than with any other brand.*

A Texaco Lubrication Engineer will gladly help you select the proper oils to give you maximum efficiency at lowest possible cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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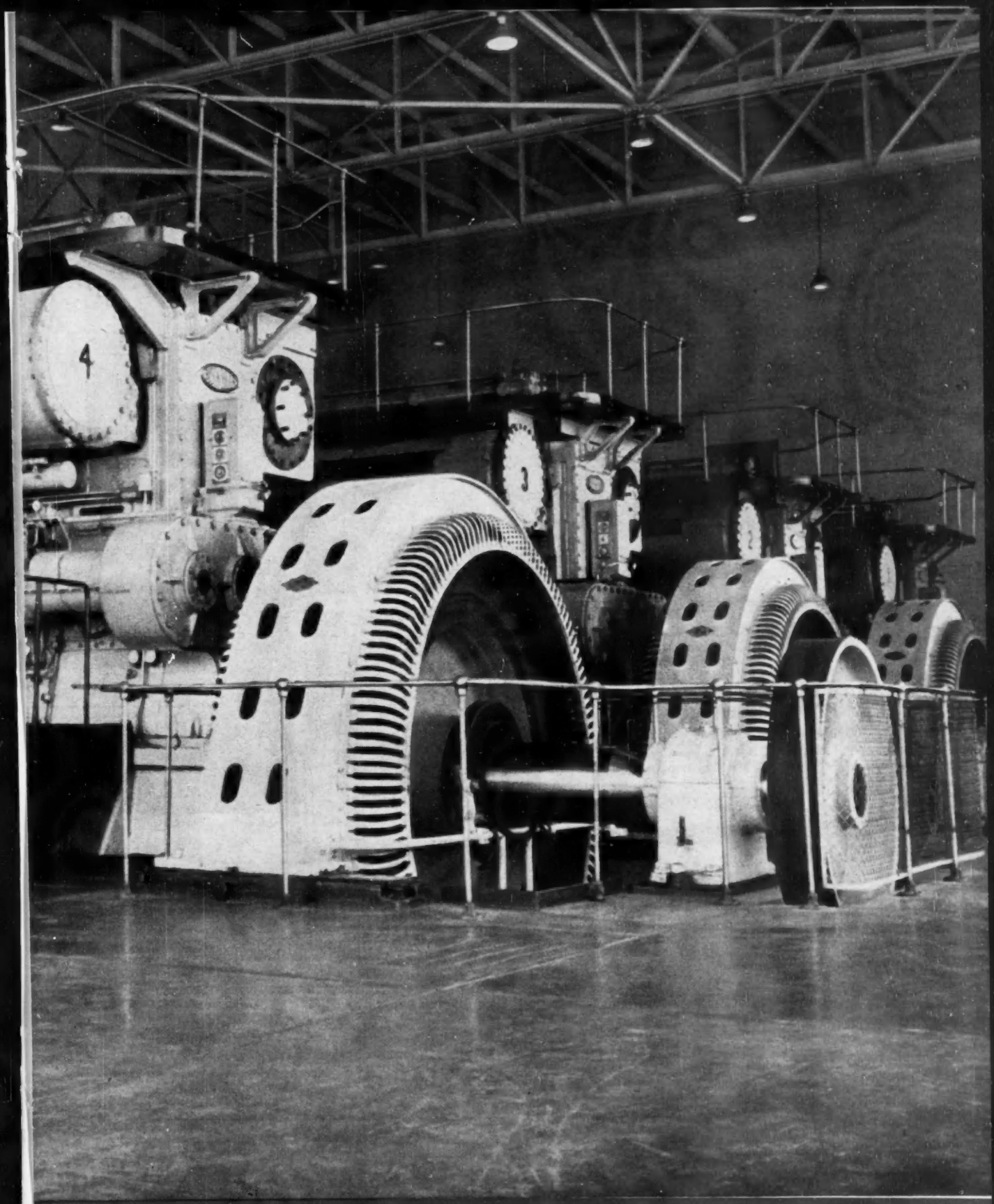
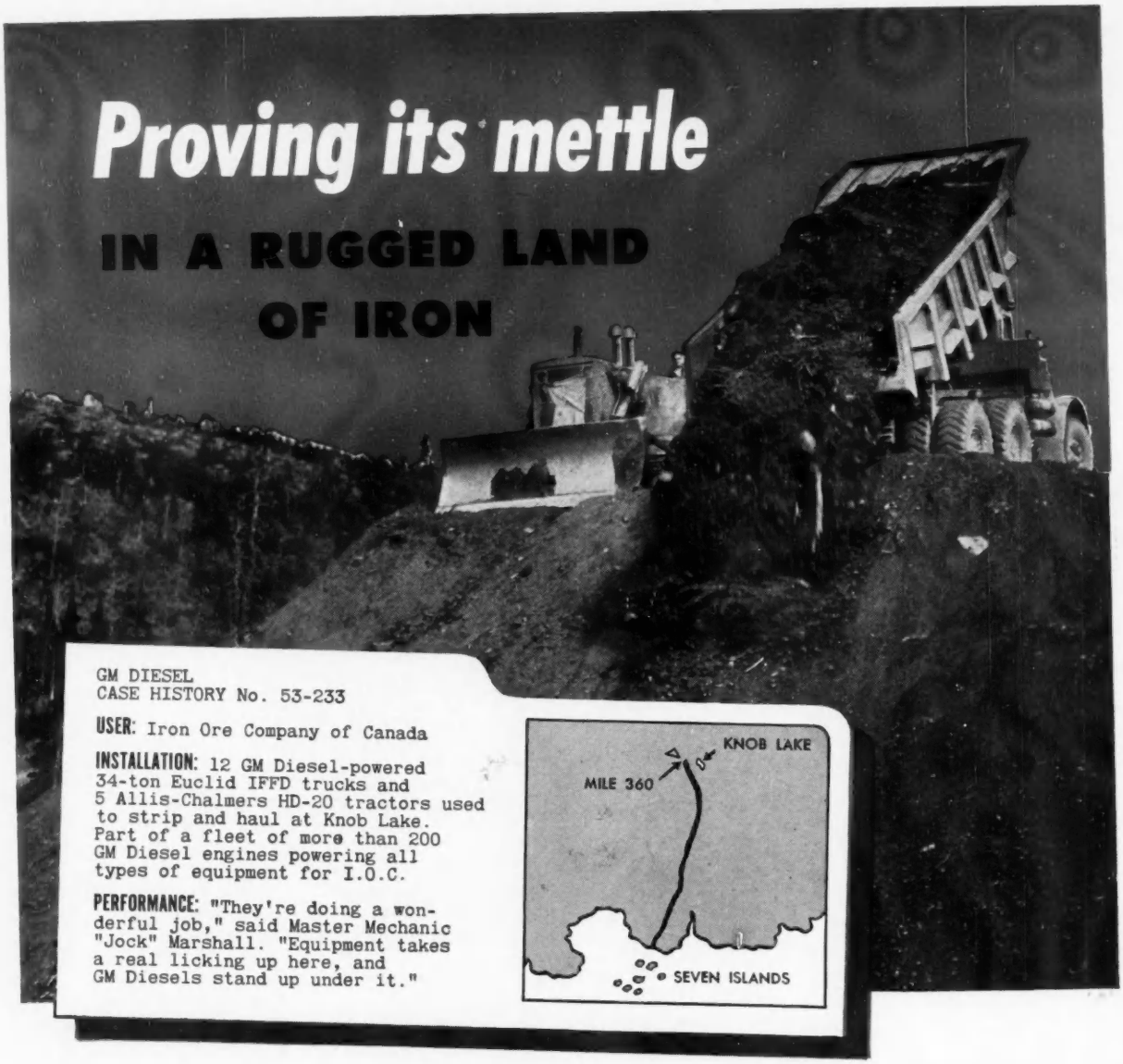


URSA OILS

FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

Proving its mettle

IN A RUGGED LAND OF IRON



GM DIESEL
CASE HISTORY No. 53-233

USER: Iron Ore Company of Canada

INSTALLATION: 12 GM Diesel-powered 34-ton Euclid IFFD trucks and 5 Allis-Chalmers HD-20 tractors used to strip and haul at Knob Lake. Part of a fleet of more than 200 GM Diesel engines powering all types of equipment for I.O.C.

PERFORMANCE: "They're doing a wonderful job," said Master Mechanic "Jock" Marshall. "Equipment takes a real licking up here, and GM Diesels stand up under it."

More than 200 GM Diesel Engines on vast Ungava Project

Up at "the Knob," 360 miles above Seven Islands terminal, the Iron Ore Company of Canada relies on General Motors Diesel-powered equipment—just as it has in construction of railroad, dams and facilities all along the line.

The big double-engine "Euc" and HD-20 shown above are benching access road to the rich Ruth Lake #3 deposit, first in the area to be opened for mining. They are part of a GM Diesel-powered fleet that proved its mettle by "walking" to the end of the line under its own power—a 250-mile trek over frozen tundra in blizzards and temperatures that reached 40° below zero.

These quicker-starting, faster-accelerating 2-cycle Diesels have been delivering trouble-free performance on double-shift, 20-hour-a-day schedules ever since they arrived—a tribute to both their rugged stamina and I.O.C.'s excellent preventative maintenance program.

Whatever your need for power—in trucks, tractors, air compressors, cranes, shovels—why not learn firsthand how much more profitably and dependably this versatile GM 2-cycle Diesel can deliver it? There is a GM Diesel distributor near you who will gladly give you all the facts—and you can count on him for prompt, efficient parts supply and service wherever you are.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.

It pays to STANDARDIZE on

. . . available in more than 750 models of equipment built by over 150 manufacturers.

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diesel power

Established in 1923 **Vol. 32, No. 5** **May, 1954**

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Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Cable Address: Dieselpub — New York

This Month's Cover

Our cover commemorates the 50 years of crawler tractor development. The role of the diesel in this development has been tremendous as has been the contribution of the thousands of diesel operators and mechanics proudly displaying their miniature tractor watch fobs.

more horsepower a problem?

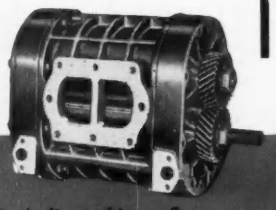
less weight per horsepower a problem, too?

There's an easy way to keep pace with the race for more engine horsepower . . . without adding weight per horsepower, without sacrificing valuable space. *Specify Miehle-Dexter Superchargers.* You'll register a big gain in horsepower—up to 50% or more —and the additional investment in equipment will be far less by comparison with other methods.

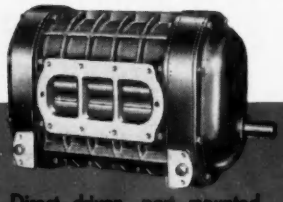
And when you put M-D Superchargers on your engines you're assured of efficient operation plus long life and low maintenance service. Exclusive M-D features make this possible. Result: dividends in fuel economy and maintenance costs.

On small jobs as well as large, M-D engineers will be glad to work with you—to help you get the exact size and type of supercharging equipment for your purpose. Write for technical brochure with specifications and performance data.

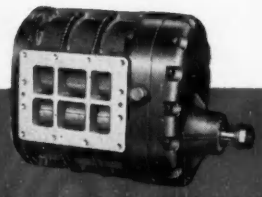
MIEHLE-DEXTER SUPERCHARGERS
are engineered to match your exact requirements



Typical direct driven, flange mounted M-D Supercharger. Develops 350 c.f.m. at 10,000 r.p.m. Other models with capacities to 4,000 c.f.m. available.

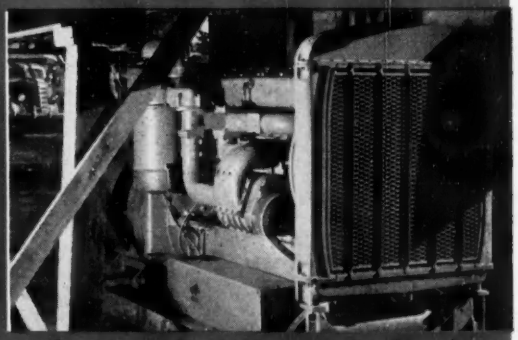


Direct driven, part mounted, Model 37100. Maximum 920 c.f.m. at 7000 r.p.m.



Belt driven, part mounted Model 5511 develops 1250 c.f.m. at 4000 r.p.m.

Supervisors at an Arizona pit mine report big, fast-moving M-D supercharged Diesel trucks climb stiff grades with power aplenty . . . sharply cut maintenance costs in moving overburden.



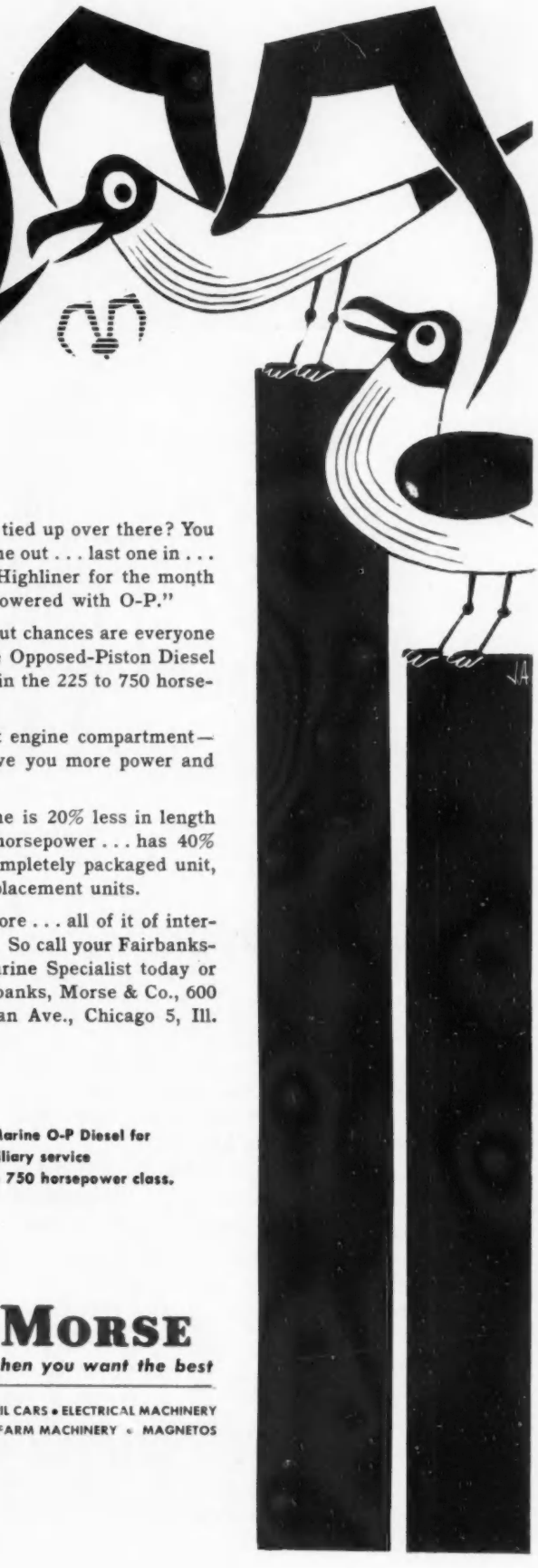
Supercharged Diesel power pays off in this rock crushing plant. The M-D Supercharger puts 50% more horsepower in the engine . . . reduces weight per horsepower by 20%. Easier portability.

MIEHLE-DEXTER SUPERCHARGER

DIVISION OF THE DEXTER FOLDER COMPANY
100 FOURTH STREET • RACINE, WISCONSIN

Trust M-D Superchargers for internal combustion engines . . . use them for blower and air compressor operations, too.

Have you heard?

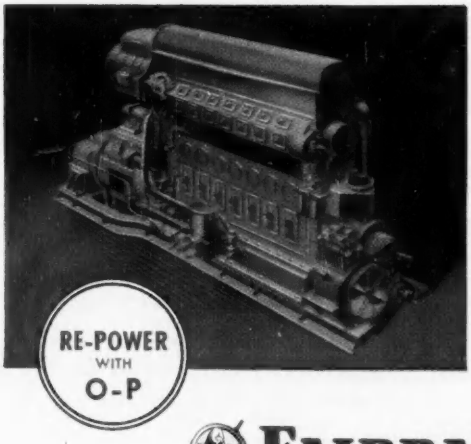


"Have you heard . . . about that boat that just tied up over there? You know, the one that always used to be the last one out . . . last one in . . . and *always* had the smallest catch? Well it's Highliner for the month . . . and all because of something called Re-Powered with O-P."

The gulls may not be talking at your dock, but chances are everyone else is talking about the *new* Fairbanks-Morse Opposed-Piston Diesel engine designed for your power requirements in the 225 to 750 horsepower class.

This is the engine that will fit your present engine compartment—with all accessories engine-mounted—and give you more power and performance!

Hard to believe? Listen to this: This engine is 20% less in length and width . . . weighs about 20 pounds per horsepower . . . has 40% fewer moving parts . . . and because it is a completely packaged unit, can be fitted for about ⅓ the cost of other replacement units.



There's more . . . all of it of interest to *you*. So call your Fairbanks-Morse Marine Specialist today or write Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

Model 38F Marine O-P Diesel for main or auxiliary service in the 225 to 750 horsepower class.

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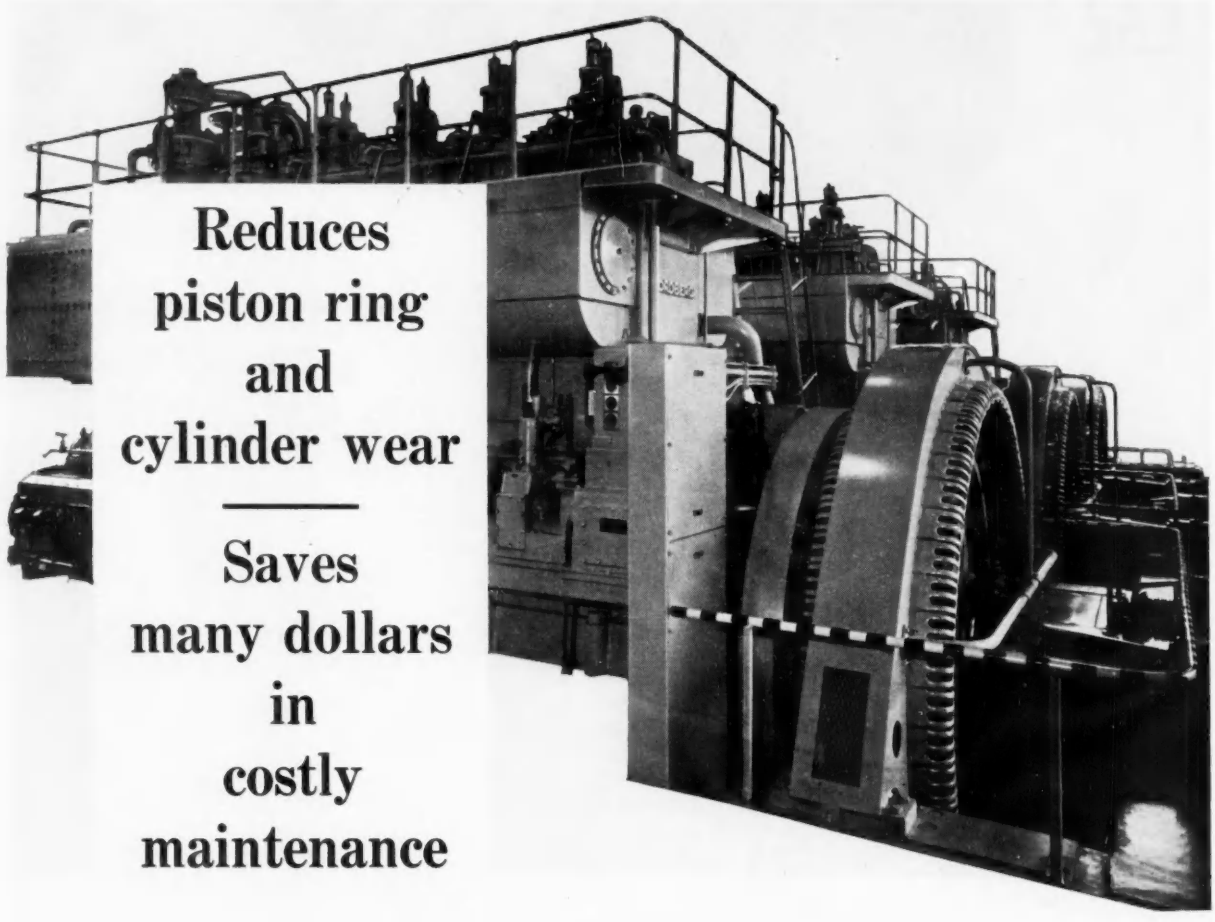
a name worth remembering when you want the best

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY
PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • FARM MACHINERY • MAGNETOS

Shell Rotella Oil



Reduces piston ring and cylinder wear

Saves many dollars in costly maintenance

These dual-fuel engines in the Municipal Power Plant at Houma, Louisiana, supply dependable, low-cost electric power to the entire city. Shell Rotella Oil is the cylinder lubricant.

Here's just one of the many diesel power plants that depend on SHELL ROTELLA OIL for reduced wear of engine parts . . . lower maintenance cost.

The anti-corrosive action in Shell Rotella Oil combats the major cause of engine wear . . . cylinder and piston ring wear caused by acid action from the by-products of incomplete combustion and condensation.

Tougher lubricating film in Shell Rotella Oil gives cylinders and rings greater protection . . . minimizes wear. Its effective detergent-dispersant action prevents harmful deposits.

Write for technical information. See for yourself how Shell Rotella Oil can help reduce your engine maintenance costs.

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SHELL

Ponca City's NINTH Nordberg engine—a 12 cylinder two-cycle Duafuel® unit rated 5135 hp.

9th BIG NORDBERG DIESEL for PONCA CITY, OKLAHOMA

"Ponca City has been *TAX FREE* for 20 years...aided by Modern Diesel Power..."

says Mr. PAT SCHLESINGER
Plant Superintendent

• During the past ten years, the Ponca City Light Department has earned net profits approaching *FIVE MILLION DOLLARS.* These profits have financed all plant expansion and civic improvements and have paid practically all the costs of local government. Ponca City has been *TAX FREE* for the past 20 years.

The secret behind this impressive record lies in sound, efficient management and the reliable, low cost operation of Nordberg Diesel and Duafuel® power. With this successful background, it was natural that when Ponca City needed more power, officials again turned to Nordberg . . . and placed a repeat order for their NINTH engine . . . a new 5,135 hp Duafuel® unit which brings the total supplied capacity up to 22,660 horsepower—all *Nordberg.*

This is another good example of the way in which Nordberg engines are being used to solve scores of power problems efficiently and at low cost . . . for public and private utilities, and industry at large. Backed by engine building experience and service *second to none,* it will pay you to think of Nordberg when you think of power. Write for further information, outlining your power requirements. *Nordberg Mfg. Co., Milwaukee, Wisconsin.*

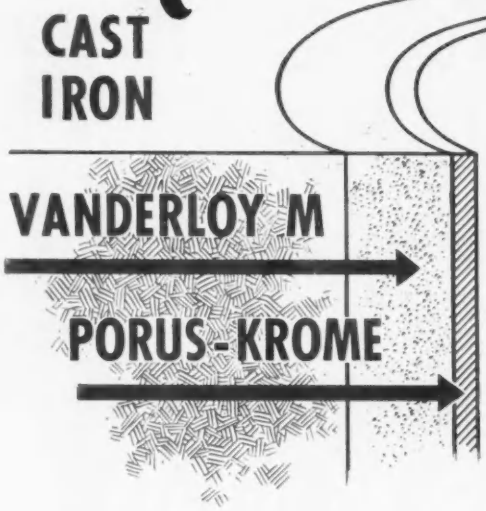
NORDBERG

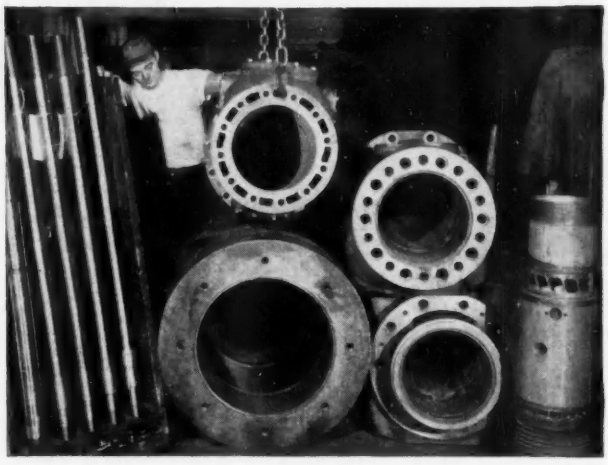
DIESEL • DUAFUEL® AND SPARK-FIRED GAS ENGINES

P154

America's Largest Heavy Duty Engine Line—10 to over 10,000 H.P.

Reverse the Wear...





VAN DER HORST
TRADE MARK

* *PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.*

U. S. PATENTS
2,048,578, 2,314,604 and 2,412,698

Why bother to have your liners oversized? Reverse the effects of wear — have your liners Van der Horst processed!

With VANDERLOY M we can plate back any liner you have to original size — and with PORUS-KROME* we can keep it that way.

A PORUS-KROME liner outwears as many as four unprocessed liners. Meantime, it uses less lube and fuel oil, delivers more power and is much easier on rings.

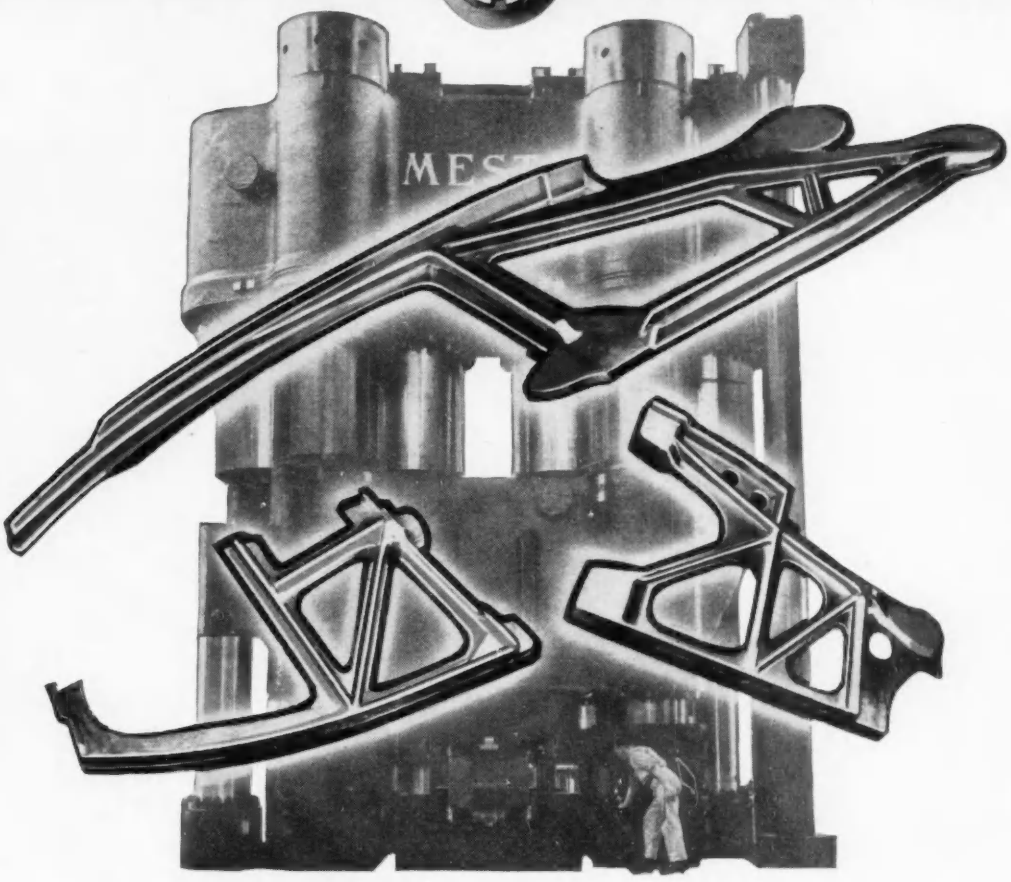
When such liners finally need replacing, simply slip in another set of Van der Horst Re-STANDARD-Sized liners — and send the worn ones back to us for renewal again.

Even liners you'd normally scrap are restored to original dimensions and each renewal pays pays for itself — several times over.

Of course the real profit comes when you eliminate the cost of stocking oversize parts — simply by having Van der Horst "reverse the wear" on all your liners. Let us show you how much can be saved by making this your standard practice.

W52-3D

VAN DER HORST CORPORATION • OLEAN, N. Y.



Greater Size and Speed in Aircraft have created engineering problems, the solution of which has required larger and larger forgings of high-strength aluminum alloy. *Examples* shown above are forged structural members used in a modern military bomber, the largest more than seven feet over all. These are forged on an 18,000 ton press, the biggest ever built in this country.

Wyman-Gordon Experience—the most extensive in the industry—is keeping abreast of new forging demands involving the use of Steel, Aluminum, Magnesium, High Density Alloys and Titanium.

• • •

Standard of the Industry for More than Seventy Years

WYMAN-GORDON

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER, MASSACHUSETTS

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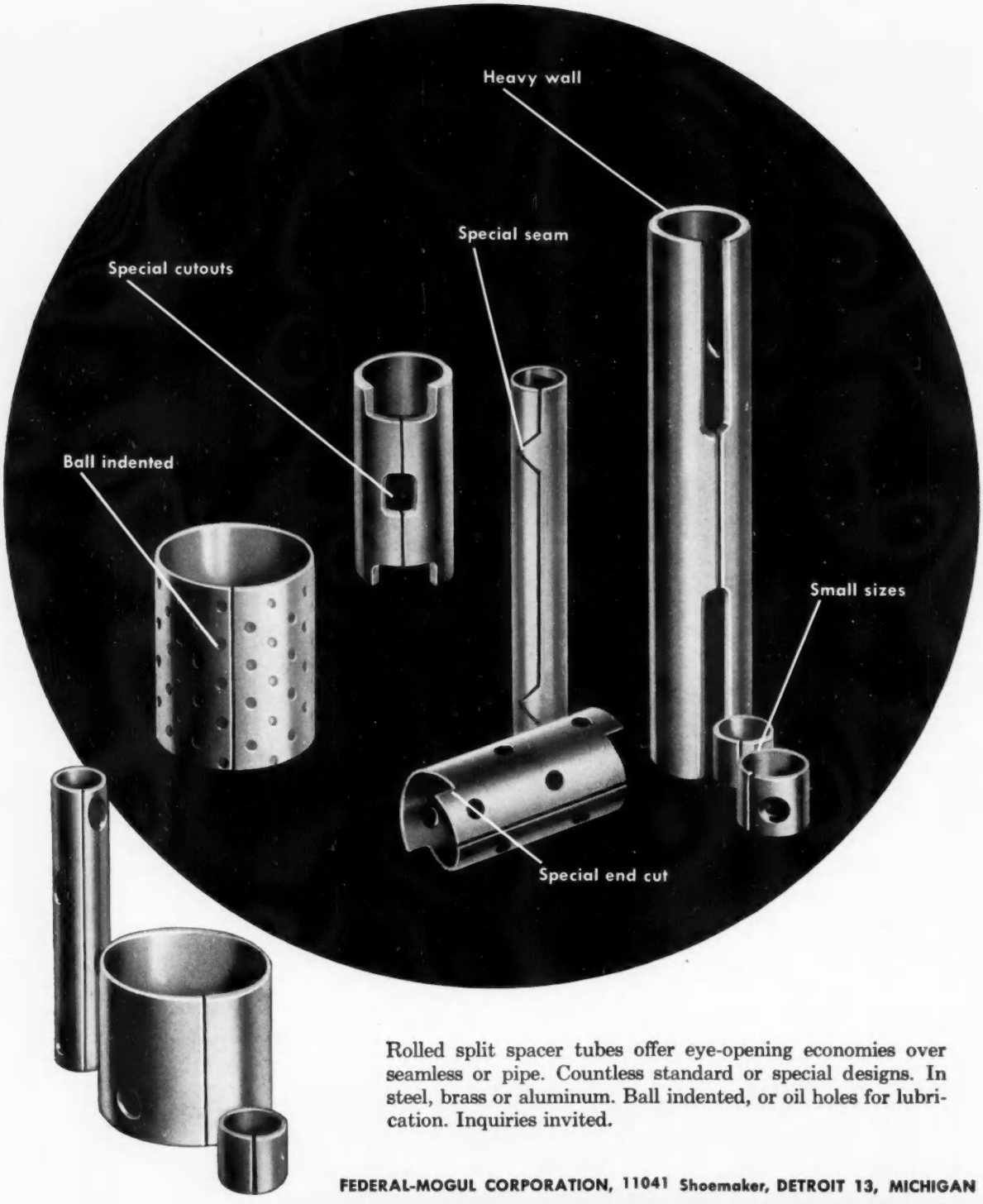


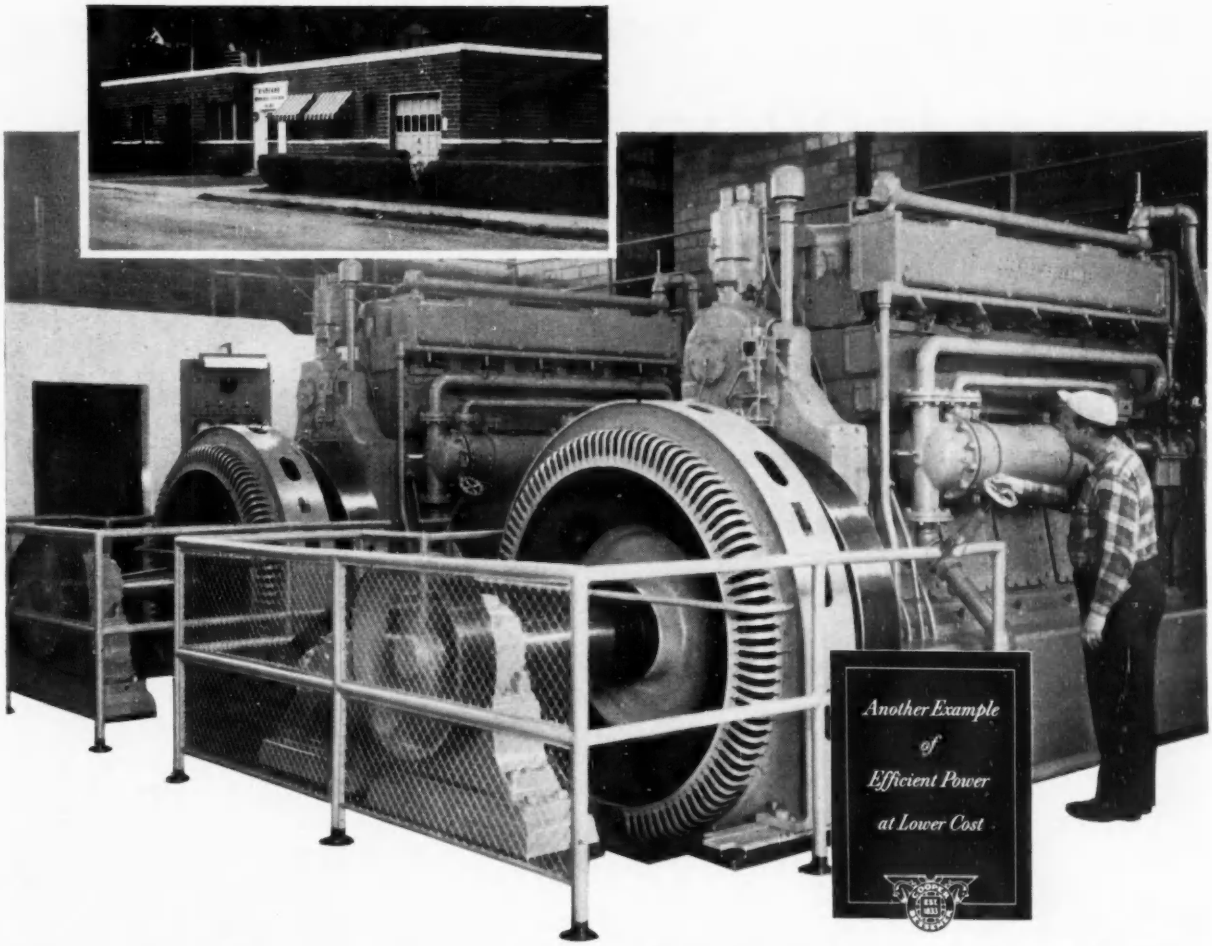
Rolled split spacer tubes offer eye-opening economies over seamless or pipe. Countless standard or special designs. In steel, brass or aluminum. Ball indented, or oil holes for lubrication. Inquiries invited.

FEDERAL-MOGUL CORPORATION, 11041 Shoemaker, DETROIT 13, MICHIGAN

FEDERAL Mogul since 1899

FEDERAL-MOGUL

Sleeve bearings in all designs and sizes; cast bronze bushings; bimetal rolled bushings; rolled split bushings; washers, spacer tubes, precision bronze parts and bronze bars.



How McGregor turned a Power Problem into $10,000 yearly profit!

TEN years ago, undependable electric power service forced McGregor, Iowa, to build their own plant.

It has proved to be a very profitable investment. Not only is the plant paying for itself . . . last year a net profit of $10,711.62 remained after expenses, depreciation, and bond retirement.

The McGregor plant is powered with two Cooper-Bessemer JS-5 diesels driving 260 kw generators. These atmospheric engines, shown above, are still giving extremely low fuel consumption on 23 gravity diesel fuel oil. Each engine runs four days, continuously. Lube oil is removed, cleaned, and replaced in one engine during the alternate 4-day period. Both engines are occasionally operated at the same time during peak periods.

If you are looking for a completely dependable engine — with exceptional efficiency and unusually low fuel consumption under all loads — be sure to get complete information on Cooper-Bessemer gas-diesels, diesels, and gas engines.

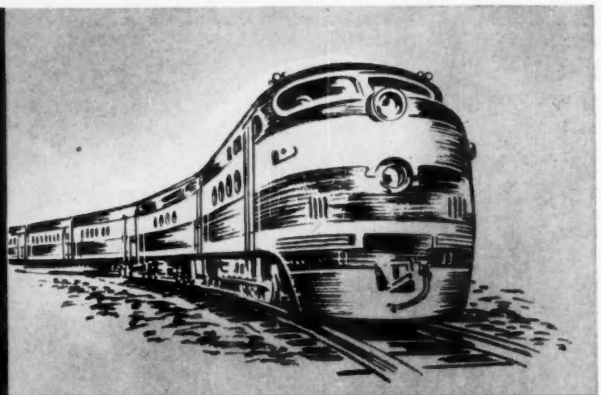
The Cooper-Bessemer Corporation

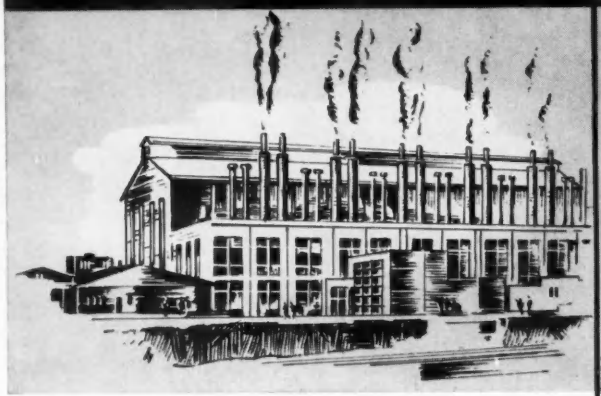
MOUNT VERNON, OHIO — GROVE CITY, PENNA.

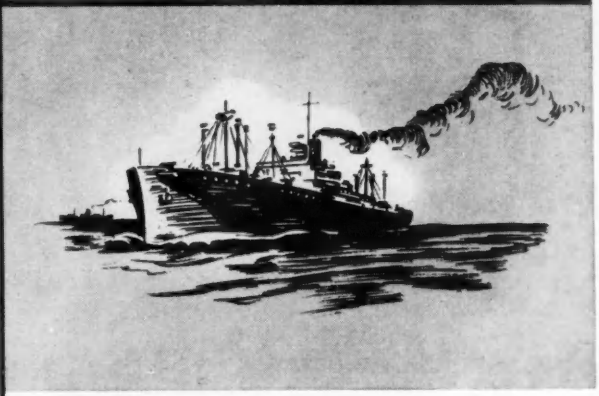
New York Washington, D. C. Bradford, Pa. San Francisco Houston, Dallas, Greggton, Pampa and Odessa, Texas Seattle Tulsa Shreveport St. Louis Los Angeles Chicago Caracas, Venezuela Cooper-Bessemer of Canada, Ltd., Halifax, Nova Scotia Gloucester, Mass. New Orleans, La.

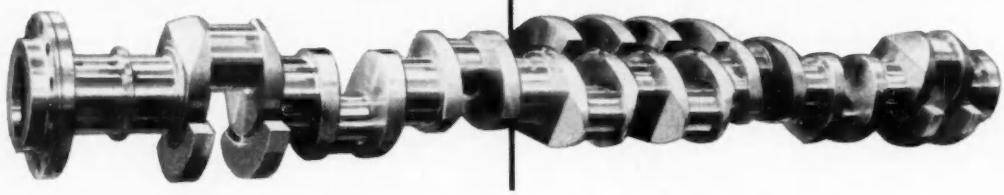
Dependable

Transmission of Power . . .
ERIE FORGE Diesel Crankshafts!

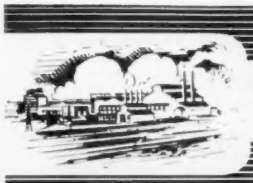




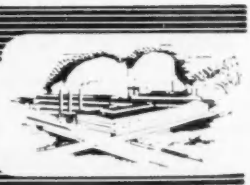




Here's the "Giant in the Diesel" . . . transmitting power that drives the modern railroad engines, pushes huge ships speedily and surely through the waves, or runs the power plants of business and industry. Erie Forge crankshafts are produced — from pouring of ingot to finished product — in our own plant. Every step is under the complete control of experienced craftsmen . . . one control, one responsibility. At Erie Forge you get the full benefit of our know-how and experience in the production of highest quality crankshafts — of exactly the right material to meet the most rigid requirements. Consult with Erie Forge on your next shafting requirements.



ERIE FORGE & STEEL CORPORATION
ERIE, PENNSYLVANIA



THE ENGINEER'S REPORT

DATA

LUBRICANT RPM Delo Oils

UNIT 325 H.P. L-P engine

SERVICE Highway hauls — heavy loads

MILEAGE 1¼ million

FIRM United Liquid Gas Co., Fresno, Calif.

Only one general overhaul in 1¼ million miles!

USING RPM DELO SPECIAL LUBRICATING OIL, the 325 H.P. engine in this truck is still in good condition after 770,000 road miles and the equivalent of 500,000 extra miles from operating the unit's delivery pump. Overhauled at 520,000 speedometer miles, only pistons, sleeves, bearings and valve guides were replaced. Crankshaft did not need regrinding. United Liquid Gas Co. uses truck to deliver 35,000-pound loads of liquefied petroleum gas. In spite of the great mileage and both on- and off-highway hauls, RPM DELO Special Lubricating Oil kept all engine parts clean. The engine, which burns propane and butane, was free of deposits at every inspection. A spare cylinder head assembly, put in stock when the truck was new, has never been used.

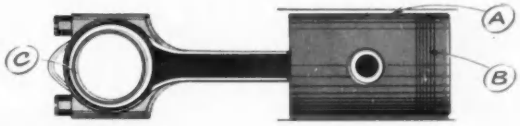
REMARKS: There is an RPM DELO Oil for every type of diesel and heavy-duty gasoline engine. They cut wear and reduce maintenance expense for operators in every industry where such engines are used.

FREE FOLDER on the RPM DELO Oils gives you complete information on how to meet any heavy-duty engine operating condition with one of these oils. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

How RPM DELO Oils reduce wear, corrosion, oxidation in all heavy-duty engines



A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

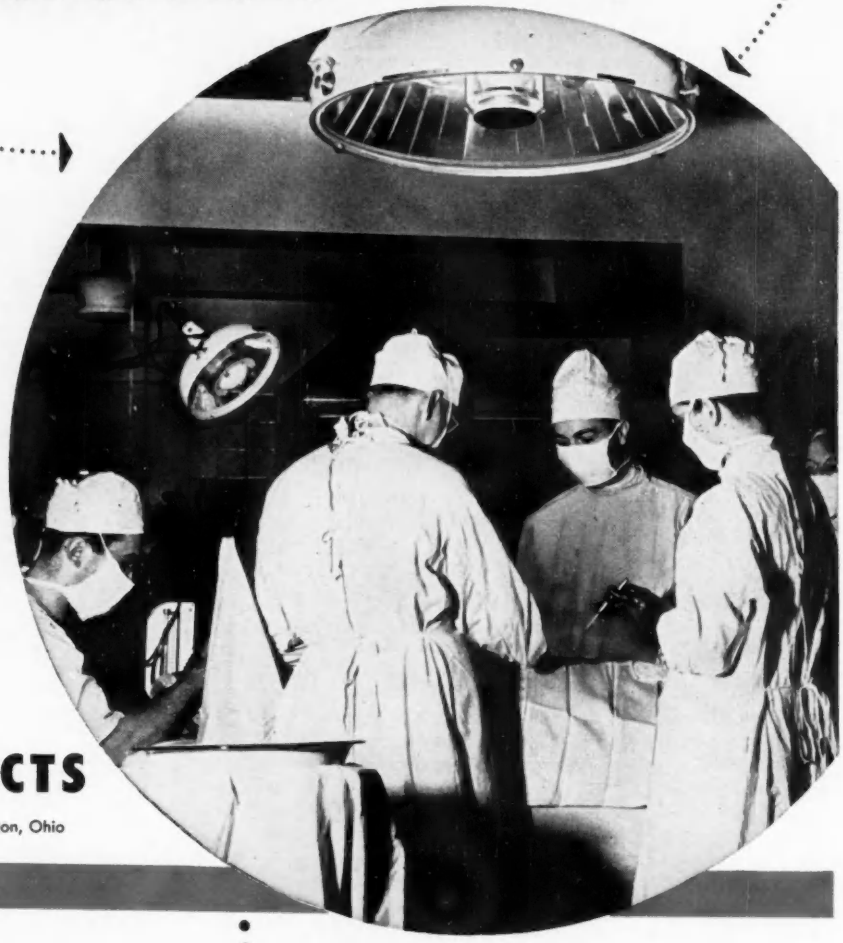
C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Barber, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado

For stand-by power

Delco Generators



Delco generators are designed to serve Diesel power plants effectively . . . and without fail. With a power range of 20 kw through 200 kw, AC and DC, 1200, 1500, and 1800 rpm, Delco generators have kept pace with Diesel engineering.

Hospitals, schools, public buildings, carnivals, circuses and outside construction jobs frequently call for power from an independent source. At such times Delco generators, time and again, prove their dependability for stand-by or portable service. Any of the sales offices listed below will be glad to supply detailed information.

DELCO PRODUCTS

Division of General Motors Corporation, Dayton, Ohio

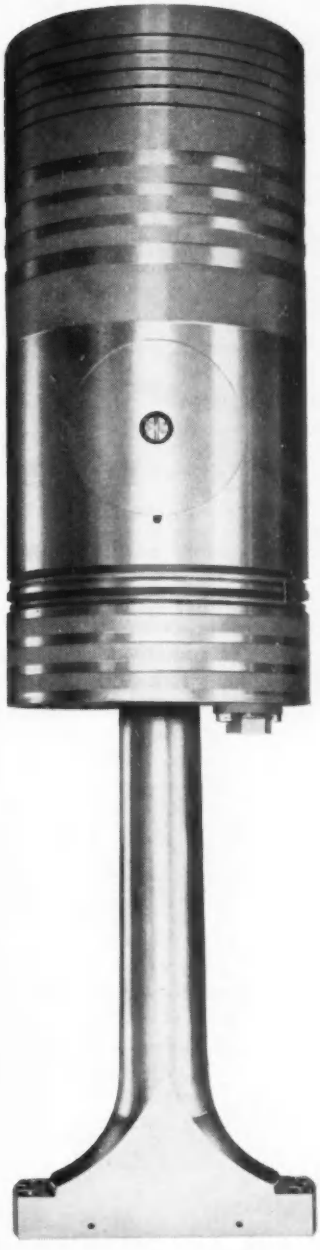
AC GENERATORS
20 kw through 150 kw at 1200 rpm
20 kw through 200 kw at 1800 rpm

DC GENERATORS
20 kw through 90 kw at 1800 rpm
20 kw through 75 kw at 1500 rpm
20 kw through 60 kw at 1200 rpm

SALES OFFICES:
ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HARTFORD • PHILADELPHIA • ST. LOUIS • SAN FRANCISCO

Q. How can the Hamilton Diesel burn heavy oil so cleanly?

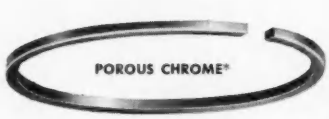
A. *The Hamilton Diesel has a semi-hemispherical combustion chamber and exclusive rotary valve and port design. These produce excess combustion air, large combustion volume and high turbulence. Result: efficient burning of the heaviest residual fuels...with clean exhaust and normal wear!*



Piston and rod assembly from a 21½ x 27½ HAMILTON DIESEL

Hamilton Division • Hamilton, Ohio

BALDWIN - LIMA - HAMILTON



Why these Koppers Piston Rings

give extra service

IT'S the materials used and the methods of manufacture that make for long piston ring service.

Koppers, with over 35 years of engineering and foundry experience, is highly qualified to combine the best of both metal and method. This experience assures you maximum service and satisfaction when you specify Koppers American Hammered Piston Rings.

Koppers engineering and research staff (which gave industry piston ring improvements such as K-Spun and Porous Chrome*) are also fully experienced in analyzing and solving problems. Koppers engineering service is ideally equipped to make recommendations for both original and replacement installations.

Similar leadership is evident in Koppers production facilities and manufacturing *"Know-how."* A large foundry equipped for both static and centrifugal castings, an up-to-date heat-treating plant, modern machine shops, an efficient testing laboratory and a complete piston ring research laboratory are Koppers physical assets. Its skilled manpower and production experts, with their widespread knowledge of the latest production techniques and practical experience in making industrial piston rings, make the products of engineering skill and manufacturing facilities an actuality . . . Koppers American Hammered Industrial Piston Rings.

American industry . . . aircraft, marine, commercial engine, railroad, petroleum, chemical . . . all benefit from this happy union. It gives them piston rings, made better to serve industry better. For help with your piston or sealing ring problems, consult Koppers first. Never any obligation. Write to: THE KOPPERS COMPANY, INC., *Piston Ring Dept.,* 1545 Hamburg Street, Baltimore 3, Maryland. **Van der Horst Process*

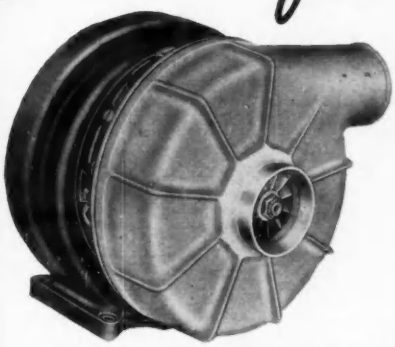
KOPPERS®

AMERICAN HAMMERED
Industrial Piston Rings

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC., BALTIMORE 3, MD.
This Koppers Division also supplies industry with Fast's Couplings, Koppers Electrostatic Precipitators, Aeromaster Fans, Gas Apparatus.
Engineered Products Sold with *Service*

USE SCHWITZER-CUMMINS DIESEL ENGINE EQUIPMENT

for Greater Operating Economy



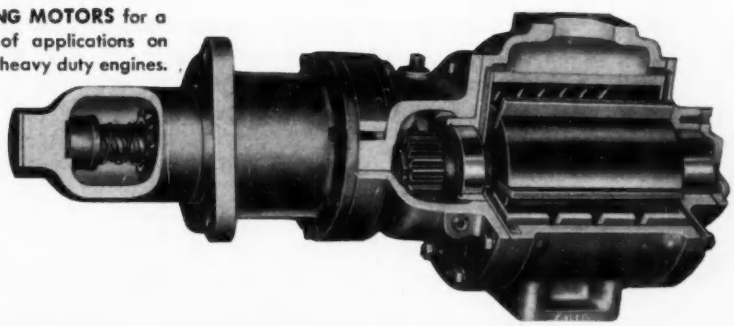
EXHAUST DRIVEN TURBOCHARGERS for engines from 70 to 200 HP.

All of our products for your Diesel engines are engineered for your particular application and requirements. More than one-third of a century of research, intensive engineering, broad field experience with unexcelled manufacturing facilities are back of our products. We gladly offer our engineering assistance and our extensive facilities to produce and serve you efficiently.

THERMOSTATICALLY CONTROLLED COOLING FANS AND FAN DRIVES. Available for installation by owner on many makes and sizes of heavy duty engines.

POSITIVE DISPLACEMENT SUPERCHARGERS for engine sizes from 50 to 500 HP and pressure ratios of 2:1 max.

AIR STARTING MOTORS for a wide range of applications on many sizes of heavy duty engines.



- COOLING FANS
- OIL PUMPS
- WATER PUMPS
- CRANKSHAFT VIBRATION DAMPERS
- AUTOMATIC SHAFT SEALS
- PUMPS FOR AUTOMATIC TRANSMISSIONS AND POWER STEERING

SCHWITZER-CUMMINS COMPANY
1125 MASSACHUSETTS AVENUE
INDIANAPOLIS 7, INDIANA, U.S.A.

"33,000 HOURS proved the choice was right!"

When a prominent North Carolina community converted its power plant to diesel operation, it called in Sinclair Lubrication Engineer Jim Holt for his recommendations on proper lubricants.

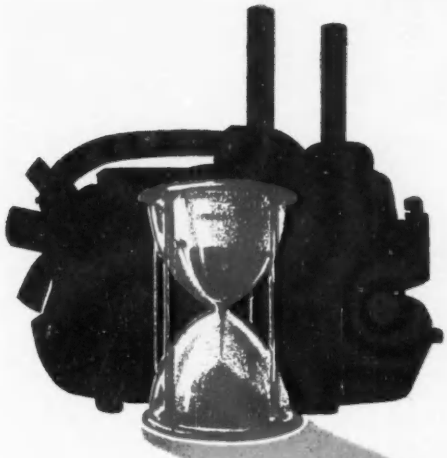
Mr. Holt reports, "I recommended Sinclair RUBILENE® My previous experience convinced me that this diesel lubricating oil would provide maximum wear protection for this power plant's six 1000 K.W. diesel engines. RUBILENE also guards against sticking rings and prevents excessive wear of cylinders, pistons and other moving parts operating continuously for long periods.

"RUBILENE was the right choice," Mr. Holt continues. "After 33,000 hours of near-continuous operation, bearings show very little discernible wear – and there's not a sign of erosive or corrosive action. *Oil consumption is remarkably low,* considering the prolonged operating hours under overload. All six 1000 K.W. engines, with a total output of 6400 K.W. per hour, *use a total of only 1 barrel of oil a day!*"

Why not give a Sinclair Lubrication Engineer the chance to help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR DIESEL LUBRICANTS

STRETCH ENGINE WORK HOURS WITH A UNITED OIL BATH AIR CLEANER



United Oil Bath Air Cleaner used on diesel engine powering 20-ton crawler tractor.

You can add hundreds of hours of operation to an engine by installing a United Oil Bath Air Cleaner. Here's why. Efficient United Air Cleaners prevent over 99 percent of airborne dust from entering the engine — protect rings, pistons, sleeve bearings from excessive wear.

Back of United are over 30 years of air cleaner experience. Time-tested United Oil Bath Air Cleaners have proved their worth on thousands of diesel engines used for powering trucks, tractors, road machinery, stationary and portable power units.

Experienced United Specialties sales engineers can help you with up-to-the-minute counsel on problems relating to the design and use of oil bath air cleaners. Write for complete details.

UNITED SPECIALTIES COMPANY

United Air Cleaner Division — Chicago 28 — Mitchell Division — Philadelphia 36 — Birmingham 11, Alabama

AIR CLEANERS ★ METAL STAMPINGS ★ ROLLED SHAPES
IGNITION AND TURN SIGNAL SWITCHES ★ DOVETAILS

"Torqmatic Drives Cut Costs"

Heading down a rock-strewn grade with a 40-ton payload at Gavins Point Dam, this bottom-dump "Euc" easily takes the rough going with Allison's TORQMATIC DRIVE transmitting engine power.

Western Contracting Corporation started saving money when the firm put a fleet of TORQMATIC-equipped 27-yard Euclid bottom-dumps to work at Gavins Point Dam. Company officials report:

"Clutch repairs are eliminated in the TORQMATIC-equipped units because there's no clutch pedal for drivers to push. Clutch life averages 90 days in a fleet of direct-drive trucks also working for Western on this job.

"Used to lose as many as 4 drive lines a week with drivers *manually* coordinating engine and drive line on the direct-drive units . . . *never lost a drive line* with TORQMATIC DRIVES."

On TORQMATIC-equipped trucks, drivers quick-shift at full throttle — have only 3 forward speeds (instead of the usual 7 or 10) to handle all loads and grades. The converter-transmission team eliminates gearshift guess and gearbox clash. TORQMATIC DRIVES have such an excellent operating record on this job that the operator intends to specify them in future equipment orders.

If you're one of the men who's changing the face of the earth, do it better and at less cost with Allison TORQMATIC DRIVES in your units. For more information, ask your equipment dealer, manufacturer or write:

Allison Division of General Motors
Box 894S, Indianapolis 6, Indiana

ALLISON TORQMATIC DRIVES

Unbeatable Team for Maximum Operating Economy

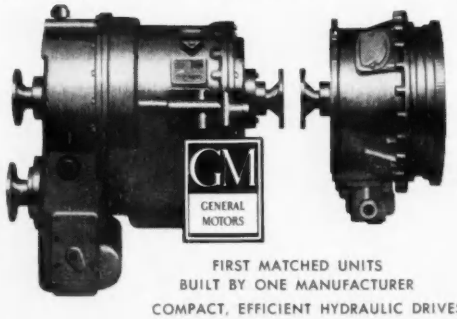
Reduces maintenance costs by absorbing shock—eliminates engine lugging—prolongs equipment life.

Holds power to load at all times—no clutch pedal to push—no gearshift guess.

Quick-Shifts at full throttle with finger-tip hydraulic control.

Only torque converter-transmission team designed to work as a unit and built by one manufacturer.

Cuts driver training costs.

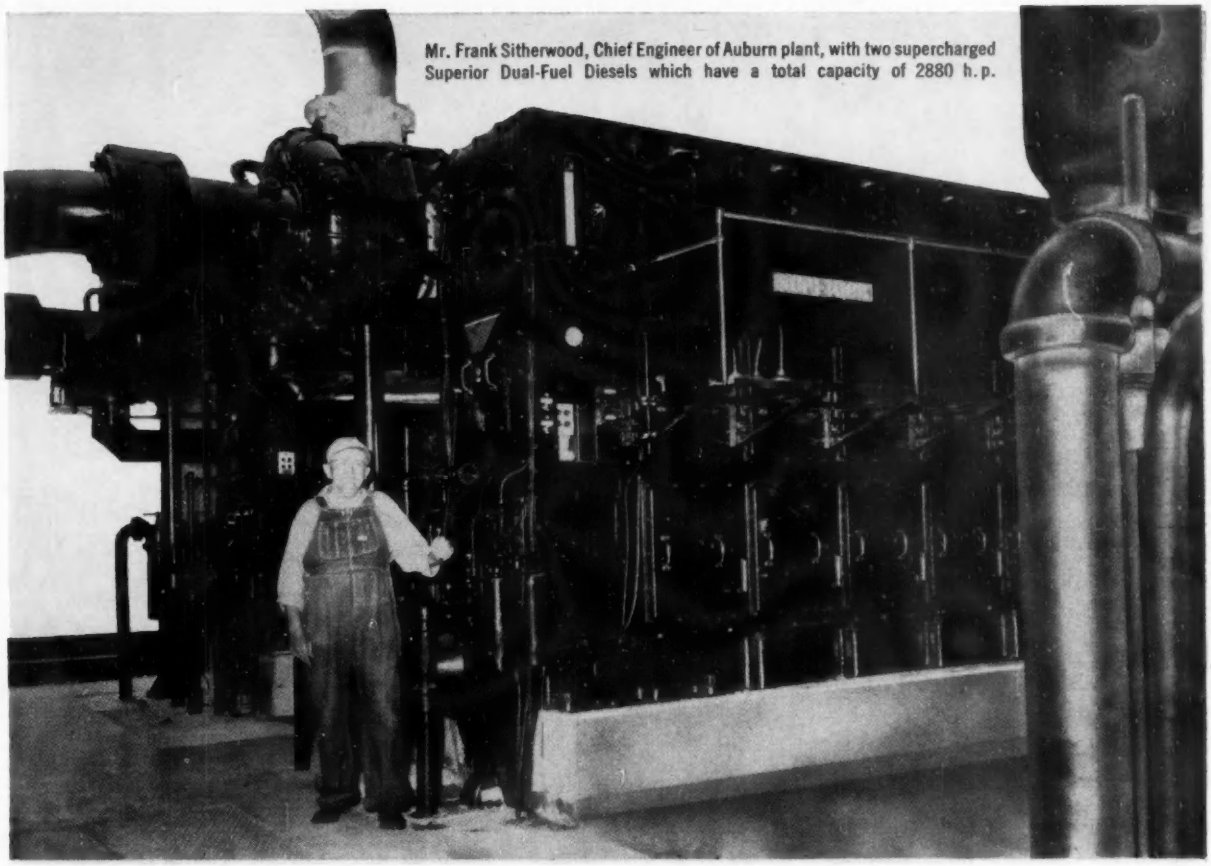


FIRST MATCHED UNITS
BUILT BY ONE MANUFACTURER

Allison

TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR CRANES • TRUCKS • TRACTORS • SCRAPERS • SHOVELS • DRILLING RIGS



Mr. Frank Sitherwood, Chief Engineer of Auburn plant, with two supercharged Superior Dual-Fuel Diesels which have a total capacity of 2880 h.p.

Auburn, Nebraska, pays off power plant debt

5 years ahead of schedule!

This year, the Board of Public Works of Auburn, Nebraska, plans to pay the last $76,000 of a bonded debt which totaled $279,000.00, five years ago. This final payment is five years ahead of schedule, for which the Board gives credit to a pair of Superior Dual-Fuel Diesels.

The first Superior, originally a straight diesel rated at 960 h.p., was installed in the power plant in 1946. Dual-fuel equipment was added in 1948, to enable the engine to operate on diesel or natural gas, depending on supply and price.

The following year, the Board produced 190,000 *more* kilowatt hours of electricity for 21,800 *less* dollars. Fuel savings accounted for all but $250 of the total cost reduction!

When Auburn's generating capacity had to be increased in 1949, the Board bought a new Superior supercharged dual-fuel diesel—for obvious reasons—and in 1952, added a supercharger to the first one.

This is just one example of the many outstanding economy records made by Superior and Atlas Diesels. You can easily get more information on the engines to profitably meet your power needs by calling the nearest sales and service office listed below.

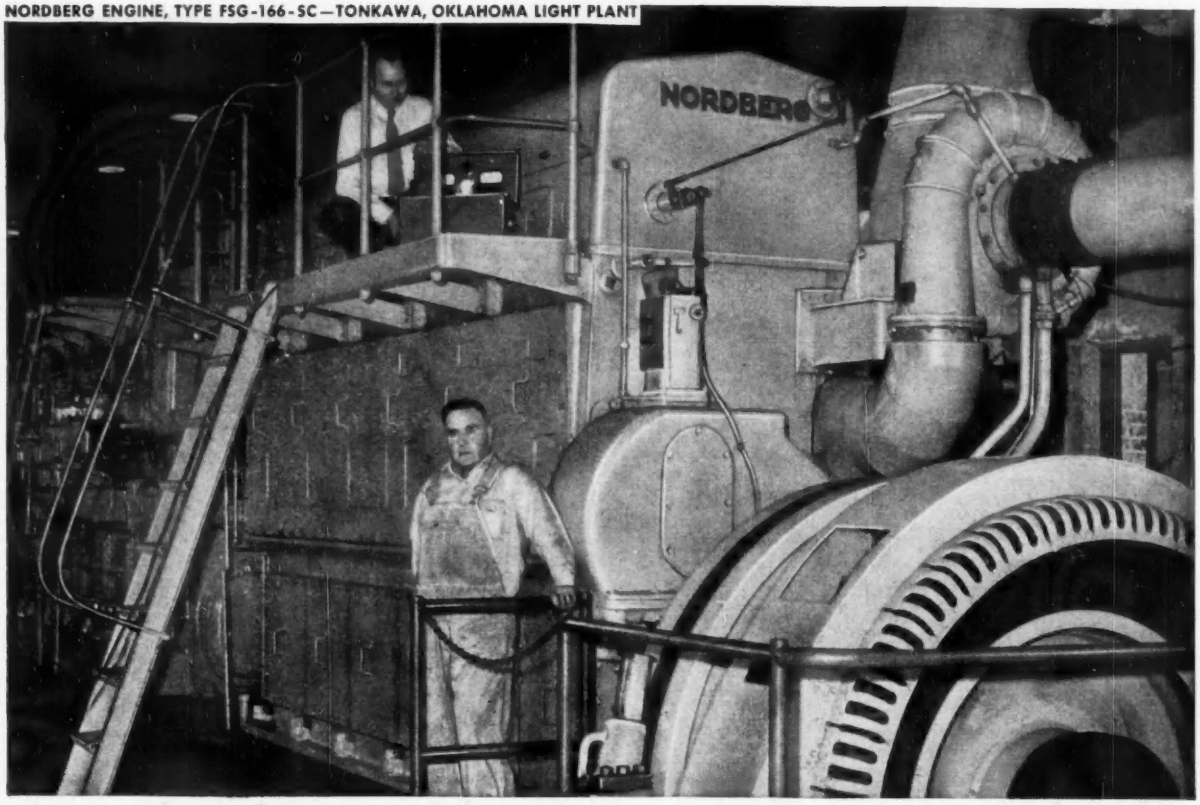
DIESEL DUAL FUEL GAS — THE NATIONAL SUPPLY COMPANY — ATLAS Imperial DIESEL ENGINES — Superior ENGINES — DISTRIBUTOR OF Lister DIESELS IN U.S.A.

THE NATIONAL SUPPLY COMPANY

ENGINE DIVISION PLANT AND GENERAL OFFICES: SPRINGFIELD, OHIO

SALES AND SERVICE POINTS: Gloucester, Massachusetts • Houston, Texas • Fort Worth, Texas • San Diego, California Oakland, California • Terminal Island, California • Ketchikan, Alaska • Washington, D.C. • Chicago, Illinois • Portland, Oregon • Astoria, Oregon • Casper, Wyoming • Halifax, Nova Scotia • Vancouver, B.C. • Toronto, Ontario • Park Rapids, Minnesota • New York, New York • Seattle, Washington • New Orleans, Louisiana • Pittsburgh, Pennsylvania

NORDBERG ENGINE, TYPE FSG-166-SC—TONKAWA, OKLAHOMA LIGHT PLANT



30,000 HOURS, NO WEAR!

MICROMETER MEASUREMENTS			
LINER MEASUREMENTS		WITH CRANK	90° TO CRANK
#1 Liner	Top	16.004"	16.008"
	4" down	.003"	.006"
	8" down	.0035"	.007"
#2 Liner	Top	16.003"	16.002"
	4" down	.002"	.001"
	8" down	.001"	.0005"
#3 Liner	Top	16.005"	16.007"
	4" down	.004"	.006"
	8" down	.003"	.008"
#4 Liner	Top	16.003"	16.004"
	4" down	.004"	.005"
	8" down	.001"	.002"
#5 Liner	Top	16.004"	16.000"
	4" down	.003"	.000"
	8" down	.003"	.001"
#6 Liner	Top	16.003"	16.0015"
	4" down	.0015"	.0015"
	8" down	.0015"	.0005"
(Original machine shop tolerance—16" plus or minus .001")			

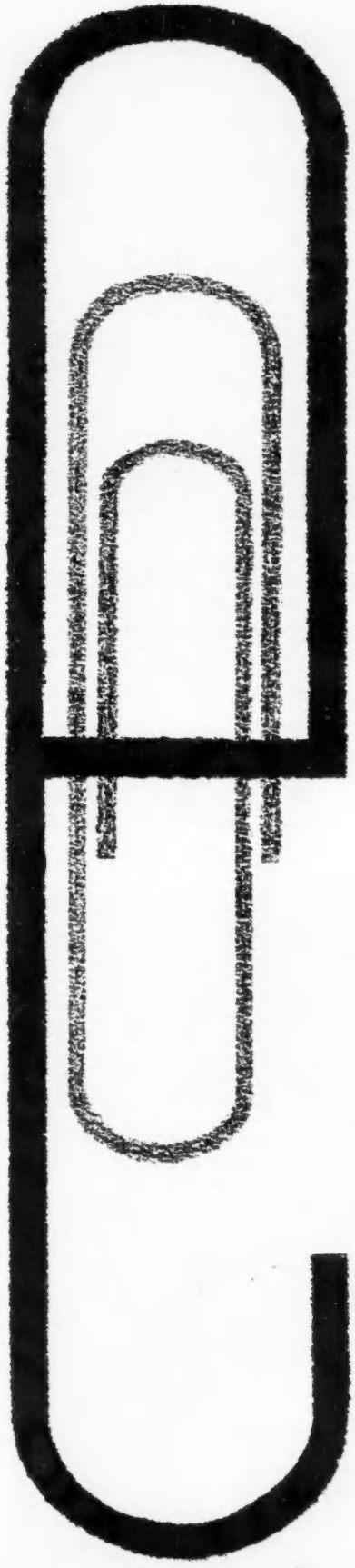
CITIES SERVICE
QUALITY PETROLEUM PRODUCTS

No Wear On Rings Or Liners With Great Cities Service Diesel Oils!

When the Tonkawa City people pulled this Diesel off the line for periodical inspection, it had logged 30,038 hours and was approximately six years old. After they had the engine torn down, micrometer measurements were taken on the cylinder liners. THEY COULD FIND VIRTUALLY NO APPRECIABLE WEAR ON RINGS OR LINERS!

They were so amazed that they had another man in the plant take his own micrometer readings. Still not certain that an engine could run that long with so little wear, they had the micrometer itself checked! The instrument checked out perfectly!

Men who have worked with Diesel Engines all their lives have said that they've never seen an engine with that much time in service with so little wear. Obviously, a great deal of the credit must go to the maker of these splendid engines, but also, credit must be given to the high-quality, wear-reducing Cities Service Diesel Oils used in this engine. You'd be wise to buy yourself this kind of inexpensive diesel-engine protection too. Call your nearest Cities Service Office or write Cities Service Oil Company, Sixty Wall Tower, New York City 5, N. Y.



Trouble Isn't All Bad

Automobile engine designers are finding that there's more to high compression operation than just squeezing down combustion chamber size. Higher octane ratings, for example, can't fully control preignition; "particle ignition" (glowing deposits to us folks) are often the limiting factor. Think that they'll lick the problem? Darn right they will! This time they're trying a chemical approach along with their oil company friends. Result—special lube oils to lower the ignition temperature of carbon and keep it from forming deposits. A parallel case of such cooperation in our field was the development of Supplemental List II oil for use with high-sulfur fuels. So because somebody got into trouble, advances were made on a broad front. Some developments are inspired but often they come about through efforts

ditorially speaking

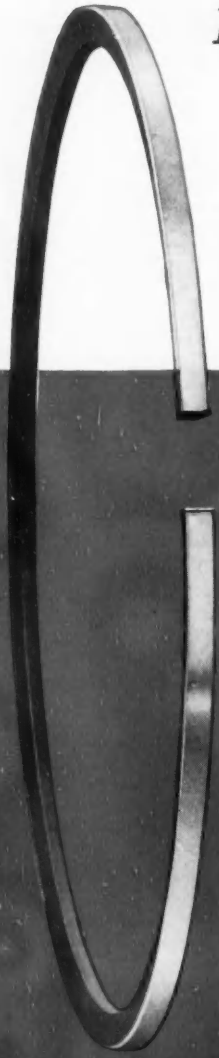
to get out of trouble. Then the solution becomes a new block in the platform of knowledge for the launching of tomorrow's projects. Economic troubles are a powerful incentive, too. They provide the impetus for engine refinements, better and cheaper manufacturing techniques, and even development of new types of prime movers. Research on free-piston engines and gas turbines, for example, is aimed at ultimate solution of someone's operational or economic problems. The point is that troubles and advancement seem to go hand in hand. It's another chicken or the egg routine. No matter which comes first, trouble must be considered as an irritant, not a deterrent. When we stop having troubles no one will be trying anything new and advancement is dead. Pollyana-ish? Perhaps, but true.

D.E.

Cyclan withstands impact, hammering, flexing

No other piston ring material combines so many advantages as

Cyclan



- Cyclan is Sealed Power's new alloy for extreme operating conditions.
- Cyclan's strength approaches that of steel.
- Cyclan's resilience exceeds that of cast iron.
- Cyclan retains the bearing characteristics of cast iron.
- Cyclan has extra high impact value for resisting shock.
- Cyclan rings retain their true shape even after considerable deflection.
- Cyclan piston rings are especially durable in super-charged engines.
- Cyclan can be readily chrome-plated, but functions efficiently without plating.
- Cyclan is available for original equipment rings in heavy duty engines.
- Some Sealed Power Cyclan Ring Sets are available for replacement use now. Others will follow soon.

Let our engineers tell you the Cyclan story!

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

highlights

- Due to continued dieselization and rapid expansion of natural gas facilities, coal production continues to decline.

- During the 12-month period ending September 30, 1954, Austria will supply Greece with diesels in sizes of over 20 hp, to a value of approximately $300,000.

- The 32nd Annual Convention of the Automotive Engine Rebuilders Association will be held at the Statler Hotel in Buffalo, New York, from May 24 to 26, 1954.

- Atlantic City will be the scene of the Summer Meeting of the SAE. The meeting will be at the Ambassador and Ritz Carlton Hotels from June 6 to 11th, 1954.

- An estimated $43 billion has been invested for tools and facilities in oil and gas industry. That's enough to buy the Pentagon more than 518 times over.

- During 1953, the Lackawanna added 20 diesel-powered locomotive units to its fleet.

- As of March 1st, 1954, Class I railroads had 521 locomotive units on order and owned 28,353 locomotives.

- Four self-propelled diesel rail cars have been ordered from The Budd Company by the Jersey Central Lines.

- A diesel-powered truck won the 1953 annual "Go Slow" race, held in Paris, France. It travelled approximately 15 inches in 12 hours.

- Four new 1500-hp diesel-electric locomotives were recently put in service on the Rock Island within the Cedar Rapids Area. They are EMD units of the hood type, equipped with steam generators, capable of handling either freight or passenger cars.

- The Canadian International Trade Fair will be held in Toronto from May 31 to June 11, 1954.

- Illinois Institute of Technology in Chicago for the first time this summer will offer a refresher course in "Basic Oil Hydraulics".

- Los Angeles, California will be host to the Western Plant Maintenance Show from July 13 to 15, 1954. The place—Pan Pacific Auditorium.

- The tonnage of crude oil and natural gas produced in the nation last year was greater than that of any other single commodity.

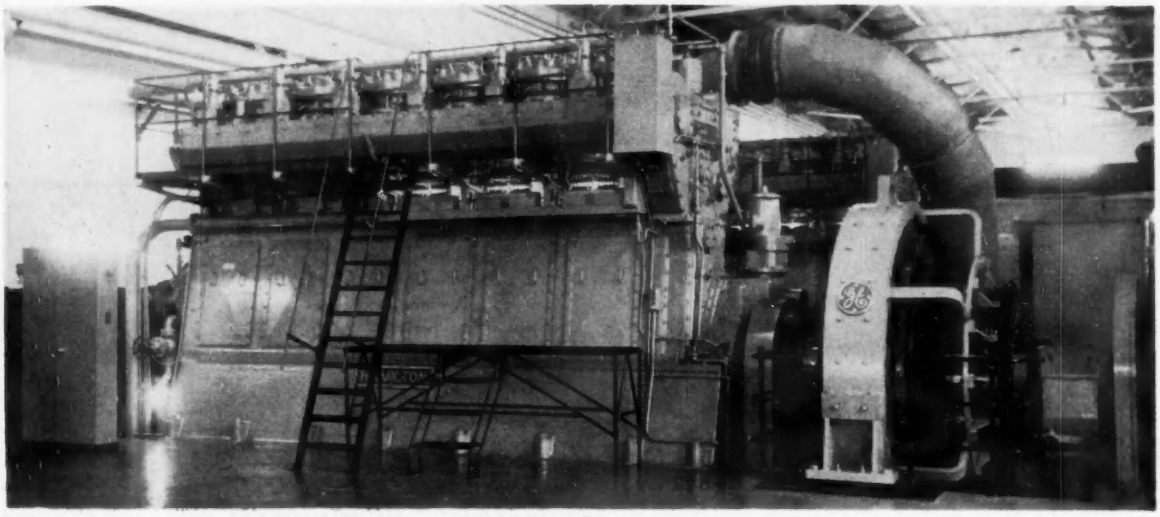
- According to GM, the electricity produced by a 1500-hp diesel locomotive is sufficient to meet the lighting requirements of 2000 average homes.

- The Locomotive Maintenance Officers Association has cancelled its September 1954 Annual Meeting. However, the Committees will present papers at various railroad clubs.

- June is the month for the 26th Annual Conference and Exhibit of ASME's Oil and Gas Power Division. This year it will be in Kansas City, Missouri at the Muehlebach Hotel from 14th to the 17th.

- The Erie Railroad's complete conversion from steam to diesel power includes not only the locomotives, but tugboats, wrecking outfits and locomotive crane operations as well.

- The total footage of oil wells drilled in 1953 was close to 200 million feet. This figure represents a 10 per cent increase over 1952 totals, according to API. If this drilling had taken place in one spot, the hole would have gone through the earth almost five times.



Engine No. 2 was installed in April of 1953. The first engine (in background) went on the line in April of '51. Both are Model 921SA Hamiltons.

DIESEL POWER for

By John H. Wetherell, Jr.
Associate Editor

ONE of the world's largest electrolytic copper producing plants has installed diesels. This is the Raritan Copper Works of the International Smelting and Refining Company, located at Perth Amboy, New Jersey. Incidentally, the company is more generally known as "Anaconda".

Our interest was aroused when we learned of diesels being installed in a plant which in the past has been predominantly steam powered. The application also interested us. Power was for electrolytic ore reduction which parallels the operation at several large aluminum ore reduction plants in the Southwest where diesels and gas engines are doing such a good job. We wanted to see how far this parallel went.

Power for the entire Raritan Works is supplied by a steam engine generator, steam turbines, and now diesel-driven generators. When diesels are integrated into the operation of a steam-powered plant, it is natural to want to know "Why". There has to be a good reason. The need for increased capacity alone is not necessarily the complete answer; there is usually more to it, as showed up in this case.

However, the best way to get the answer is to ask the men who have to live with the installation. Mr. A. E. Palm is responsible for the production of power at the Raritan Copper Works, and being chief engineer, he is our man.

When we met Mr. Palm, the "Why" was still with us and several other questions had come to mind. So preliminary to going into the details of the installation, he was asked the $64 question.

"Putting first things first," answered Mr. Palm, "this has been a steam-powered plant from the start. About 1950, additional power was required if our electrolytic copper production facilities were to be expanded. At that time we were on the knife's edge as far as power was concerned.

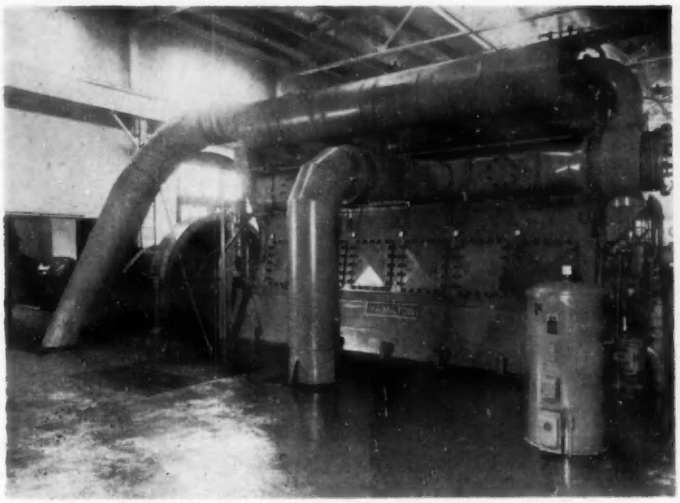
"Now before going on, let's dwell on this electrolytic copper process for a moment so you will get a better idea of our operation here. It is true, of course, that we supply power to the entire works, but the 'tanks' are of primary interest to you since you want to know about the diesels.

"The principle of the process is simple. There is an anode and a cathode immersed in a solution called an electrolyte, which is a mixture of sulphuric acid and copper sulphate with a small percentage of glue. The glue, aids in the more even deposition of copper on the cathode.

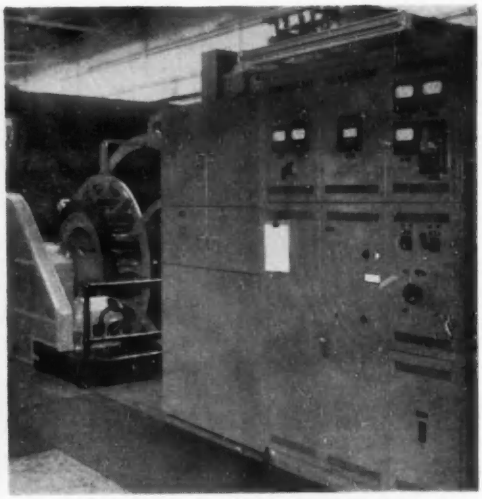
"The anode, consisting of impure copper, is electrolyzed or dissolved. The copper passes through the electrolyte, being deposited on the cathode in a higher degree of purity. Impurities drop to the bottom of the tank as the copper passes from anode to cathode."

As you can see, all this takes power—power that must be carefully controlled.

"The company wanted to add a new section of tanks to increase production," continued Mr. Palm. "This expansion program meant an increased load requirement which could not be handled with existing equipment.



Off to the left, in a separate room, is the blower for No. 2 engine. The lube oil purifier can be seen in the right foreground.



Switchgear and generators for both engines are of the same design and manufacture.

COPPER REFINING

Internal combustion engine economy and flexibility, so effective in aluminum electrolytic ore reduction plants, now show to advantage in electrolytic copper refining.

"At first 'topping' turbines were considered, but a problem of load balance arose. Then too this would mean the installation of an additional boiler. Power was also available commercially from the local utility. However, due to load characteristics peculiar to our operation, this was not the answer either.

"To be perfectly frank, we had not given much thought to the diesel as we knew little of its use. In order that the diesel might be considered, a request was sent to one diesel engine manufacturer for some basic information. In the months following, we received a flood of information from virtually every engine manufacturer producing a suitable unit. For this we were grateful, but still do not understand how the word got around so fast.

"It was subsequently found that by the use of a diesel driving a DC generator, desired characteristics could be obtained. The load on the AC board could be lightened and closely regulated DC could be produced economically for the operation of the new tank section. Now let's look at the installation."

Entering the engine room, we got the impression of a clean, well maintained installation. About the center of the room, which also houses the steam turbines, steam-driven compressors and a steam-powered engine-generator unit, are the two diesels. Both are Model 621SA Hamilton engines. Number one went on the line in April of 1951 and the second during the same month of 1953.

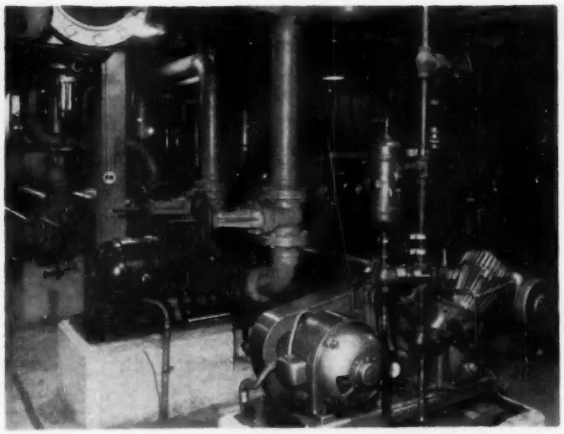
These units are normally rated 2900 hp at 257 rpm, but for this particular installation, the engines are rated 2862 hp at 250 rpm. Both engines are of the loop-scavenged, 2-cycle, in-line design, each having six cylinders of 21½-in bore and 27½-in stroke. Scavenging air is provided by Roots-type blowers driven by 250-hp electric motors.

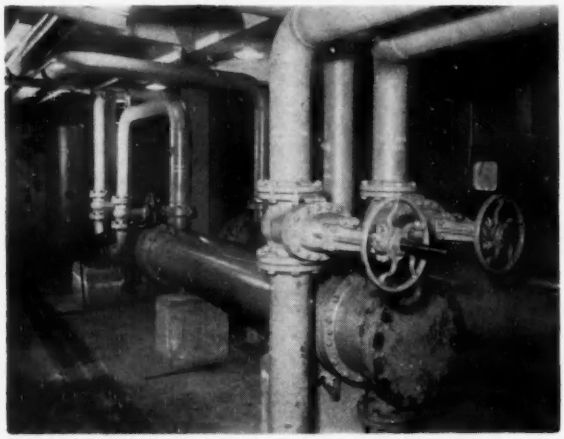
The engines are similar to the unit recently installed at the Freeport, Long Island, Municipal Power Plant. A feature of the Hamilton engine is the rotary exhaust valve. This is installed in the exhaust line of each cylinder and acts to close off the exhaust at the same time that the piston covers the scavenging port, eliminating the usual pressure drop which occurs in conventional port-scavenged engines. Hence, more air is allowed to be trapped in the cylinder.

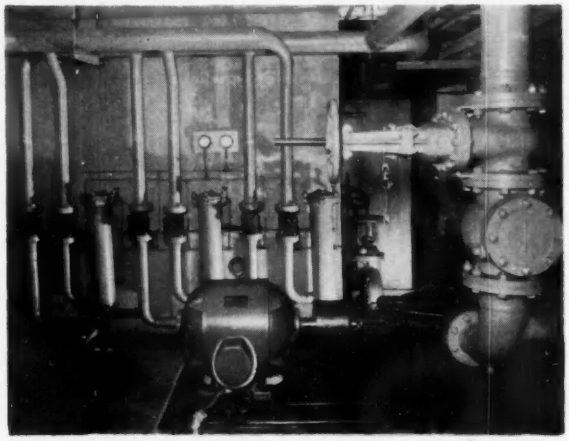
The trunk-type pistons are oil cooled and equipped with a cast iron piston head. Connecting rods are machined all over and are of the marine or "footed" type which allows the bearing box at the crank throw to be detached. Precision-type bearings are used throughout. A smaller "foot" is also employed at the piston pin end. Cylinder liners are a one-piece casting.

Design of main bearing saddles makes it possible to roll out and inspect individual bearings without disturbing adjacent parts. This is accomplished by the use of "jack-bolts" which bear on the top of the saddle and the lower part of the upper base.

At this point, we were introduced to Mr. W. L. Bennett, assistant chief engineer, who proceeded to fill us in on the operation. "The DC power produced by these en-







For the most part, auxiliary equipment is grouped near each engine foundation. The upper photo shows heat exchangers, jacket water pump, blower, and air compressor for No. 1 engine. The air compressor incidentally, serves both engines. Below, are starting air bottles, jacket water pump and heat exchangers for the No. 2 engine.

The above illustrations show additional auxiliary equipment for No. 2 engine. At the top are the intake air filters. The lower picture shows lube oil strainers, sump tank and pump. As will be noted from the illustrations, plant engineers seriously considered accessability for ease of maintenance when each installation was made.

gines," Mr. Bennett began, "is used solely for the production of electrolytic copper. At present this operation begins about 6 am on Monday and is shut down at 4 pm on Friday. During this period the engines are on the line continuously with their load being dictated by the amperage required at the tanks. For the most part, this load remains the same during the entire operating cycle.

"The important point here," he continued, "is to maintain the amperage required since any variance would affect the electrolytic deposition of copper on the cathode. Load may vary from one operating cycle to the next. This is where we cash in on the flexibility of the diesel. Engines are put on the line Monday morning and the speed set for the required amperage—they stay there 'til Friday afternoon. Should the load vary during an operating period, the diesel's flexibility allows us to correct the output almost immediately.

"Incidentally, when production is at its peak, electrolytic copper is produced at the rate of about 45 million pounds per 30-day period. Should production be such as to require the operation of only one engine, it has been our practice to operate one engine continuously for the 5-day period, switching to the other engine on the following Monday, and so on."

Auxiliaries

With the exception of a few units, auxiliary equipment is located in the plant basement adjacent to each engine foundation. This equipment is similar to that found in most plants where heavy engines are employed.

The scavenging air blower for No. 2 engine has been installed in a room just off the generator end of the engine rather than in the basement as is the case with No. 1 engine. This has aided in keeping the noise level in the plant at a low.

Among the equipment grouped near each engine foundation are the shell-and-tube-type lube oil and jacket water coolers, lube oil pump, jacket water pump, lube oil strainers, and the starting air bottles. Starting air bottles, two for each engine, are charged by a common motor-driven air compressor. Also mounted adjacent to the engine foundations are the lube oil purifier pumps, one for each engine. Purifiers are located on the engine room floor near the free or operating end of the engine.

Systems

Lube Oil—Two lubrication systems are used on the engines. Cylinder lubrication is accomplished by the use of mechanical force feed lubricators. Piston cooling and the lubrication of bearings and other parts is effected through the pressure system. This is a dry-sump engine. Lube oil from the engine sump drops to the sump tank located at the free end of the engine in the plant basement. From this point, it is pumped through strainers and coolers to the supply header on the engine.

Lube oil filtration is accomplished in a separate, bypass circuit. This runs from the sump tank, through the purifier pump, to the purifier, and back down to the sump tank again. With this arrangement, a portion of the lubricating oil is continuously being pumped through the purifier while the engine is in operation.

Jacket Water—Steam condensate is used for engine jacket water. This is a closed circuit which incorporates an expansion tank. Since large volumes of sea water are available from a local bay, salt water is used in the raw water side of the heat exchangers for both lube oil and jacket water cooling.

Fuel System—Fuel is a No. 4 of the type commonly referred to as "Mirando Crude". It has an API gravity of 22.4 deg corresponding to a specific gravity of .9196. Fuel is taken from two 15,000-gal underground storage tanks, through a strainer, by a pair of parallel transfer pumps. From the pumps, fuel is passed through a meter and on to the 275-gal day tanks. The motor-driven transfer pumps are actuated by fuel level controls in the day tanks.

Fuel from the day tanks passes through a filter to the engine fuel pump and then through a final strainer before reaching the fuel oil header on the engine. Each engine is equipped with port and metering helix-type fuel injection pumps. These are individual units mounted one per cylinder.

Engine Protection—Both audible and visible alarms have been provided for water temperature and pressure, oil temperature and pressure, fuel oil pressure at the engine header, and malfunction of the scavenging air blower. The visual portion of the alarm system is in the form of a number drop located on each engine control cubicle. An engine overspeed trip is also provided. However, this is not included in the alarm system.

By nosing around the power plant, many more questions were answered. The methods of integrating auxiliary equipment were noted as well as the circuits for this equipment. The questions that arise now concern fuel and lube consumption, engine hours, and the amount of power produced in a given period. Our man this time is Mr. A. B. LaRue, who has the figures at his fingertips.

"For the sake of clarity," Mr. LaRue said, "I will refrain from quoting cost figures since this would entail an explanation of our method of bookkeeping. This would only cloud the issue and the figures would not be comparable to other installations having a different type of operation.

"During 1952, Engine No. 1 operated 4756 hours and in 1953, 4458 hours. Engine No. 2 went on the line in April of 1953 and operated 3280 hours that year. This represents a total of 12,494 engine hours during which time a total of 17,054,000 kw hr were produced.

"To produce this power during 1952 and '53 both engines consumed a total of 1,102,300 gallons of fuel oil and 5423 gallons of lubricating oil. When computed, these figures work out to about 15.47 kw hr per gallon of fuel. This figure, however, must be adjusted since the kw hr figure is a gross total and does not allow for the power consumed by the blower motor or other electrically driven auxiliaries. The reason for this is that AC generated by steam-driven units is used to power the auxiliaries while the net DC produced by the diesels is used for the electrolytic process only."

Summing Up

Here is another case where the characteristics inherent to the diesel have been adapted to meet a specific need. Some of these characteristics seem to make the internal combustion engine particularly suitable for supplying power to the electrolytic process. The prime requisites for this type of service such as flexibility of operation are easily met.

Engine operation can be varied to meet the specific power requirements. Power is available when you want it, for as long as you want it, and there are no fuel demand costs when it is not operating.

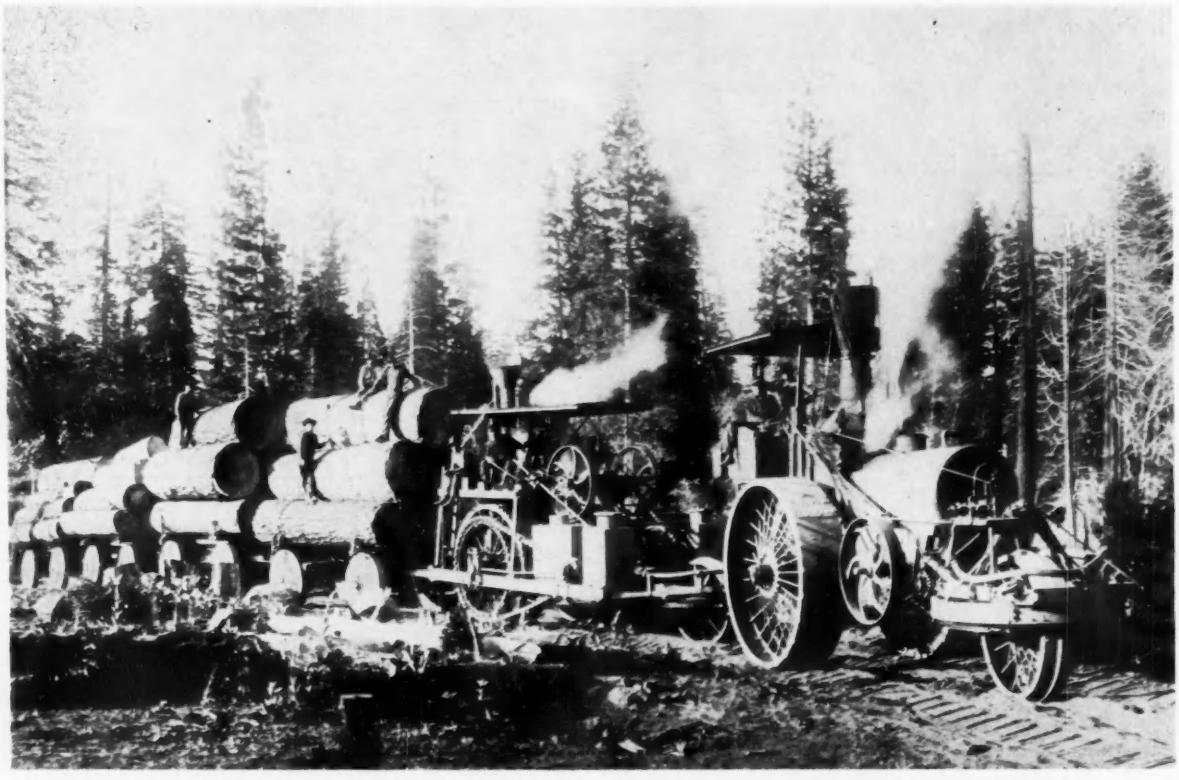
Since long operating cycles are peculiar to the electrolytic process, dependability also enters the picture. Take flexibility of operation coupled with dependability, add in economy of operation, and you have a strong case for the application of the internal combustion engine to this and many other types of service.

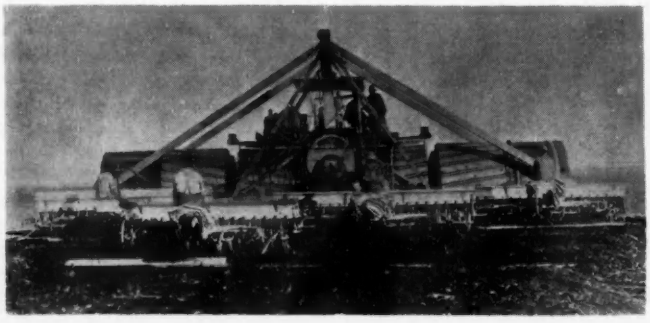
Principal Equipment for Hamilton Engines

Engines	Baldwin-Lima-Hamilton Corp.
Generators and Exciters	General Electric Co.
Blower	Roots-Connersville Blower Corp.
Motor	General Electric Co.
Governor	Woodward Governor Co.
Fuel System	
Transfer Pumps	Blackmer Pump Co.
Filters	Air Maze Corp.
	Wm. W. Nugent & Co.
Injection Equipment	American Bosch Corp.
Lube System	
Oil	Standard Oil Co., Inc. (California)
Pumps	DeLaval Steam Turbine Co.
Strainers	Wm. W. Nugent & Co.
Purifiers	Honan Crane Corp.
Pumps	Viking Pump Co.
Lubricators	Manzel
Heat Exchangers	Superior Combustion Industries, Inc.
	Ross Heater and Mfg. Co.
Intake and Exhaust Silencers	The Maxim Silencer Co.
Intake Air Filters	American Air Filter Co., Inc.
Jacket Water Pump	Ingersoll-Rand Co.
Switchgear	ITE Circuit Breaker Co.
Alarms	Viking Instruments, Inc.
Gauges	Manning, Maxwell & Moore
Pyrometers	Illinois Testing Laboratories, Inc.
Air Compressor	Ingersoll-Rand Co.

1890's You are standing on the side hill of a Washington wheat field. It is just before the turn of the century, and although the steam traction engine is in use, horses and mules are still the principal source of power. A total of 165 horses and mules are required for the operation of these five harvesters.

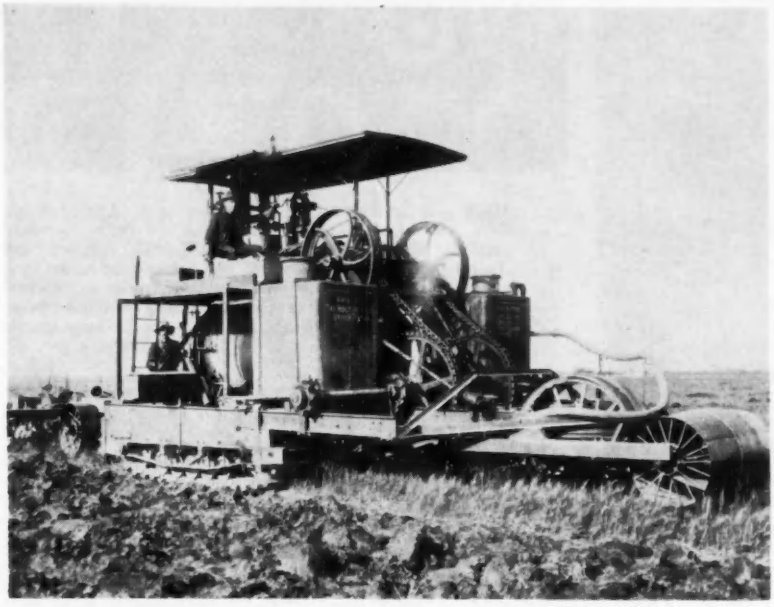
50 Years of the Crawler Tractor





1894 It is the "Big Steam Era" (1890-1910). A Best and Holt machine are teamed to haul timber in this California lumbering operation. Steam traction engines are receiving wider application and "more power" is becoming a familiar cry. But weight and size of these units are increasing out of all proportion as horsepower is added. Is steam the answer?

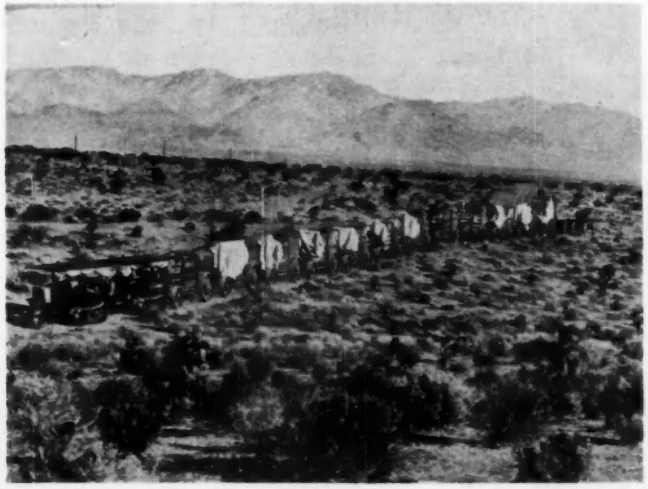
1898 Here in the San Joaquin Valley, as well as in other parts of California, soft soil is predominant and poses another problem. More wheels have been added to the huge steam traction engines to increase soil bearing area, but the machines are more awkward and almost impossible to transport. Even these wheels, which are 8 ft in diameter, slip and stall.



1904 It is November 4th, Stockton, California, and you are witnessing the testing of the first practical crawler tractor invented by Benjamin Holt, president of the Holt Manufacturing Company. He fitted this steam traction engine with a rough set of tracks. It is a 40-hp crawler that will pull more plows, deeper, than a 60-hp wheeled unit. It has power steering.

A pictorial history celebrating the 50th year of crawler tractor development.

1906 Only about eight track-type steamers have been built in the last two years. Newfangled gasoline power has entered the picture and once again, we are in Stockton, California—this time to watch the second gasoline-powered Caterpillar (Holt's trade name) tractor being put through its paces. The crawlers are becoming more compact now that bulky steam engines have been replaced.

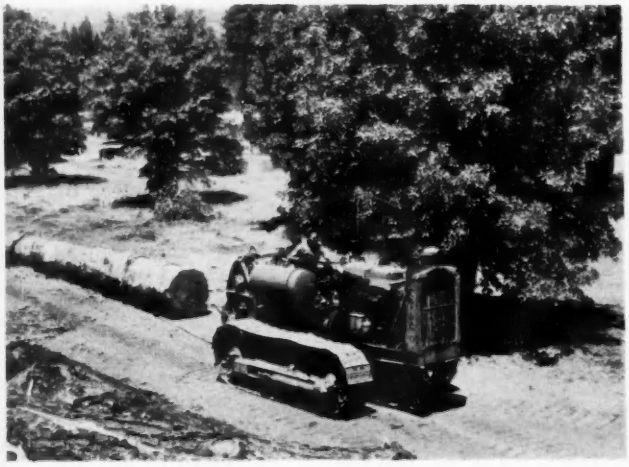


1909 Holt bought out the facilities of the Best Manufacturing Company last year, ending for a time its chief competition. The Holt Caterpillar Company was formed this year with a new plant in Peoria, Illinois. Overland transportation is becoming a good market for the crawlers. We see two Caterpillar "45" tractors pulling a wagon train across the Mojave Desert during construction of the Los Angeles Aquaduct.

1913 Holt's Peoria plant is the scene and we are here to see the first all-track unit, or "muley" as it is called. This is a significant change as the bulky tiller wheel has been eliminated. Incidentally, three years ago, the son of Holt's old competitor formed the C. L. Best Gas Traction Co., once again starting Best-Holt rivalry.

1924 It has been several years since the close of World War I in which the Holt crawler served as the standard artillery and supply tractor for Britain, France, and America. As an earthmoving tool, the crawler is foreshadowing its future position of indispensability. We're at Soldier Field in Chicago during its construction and bulldozer attachments are making an appearance.

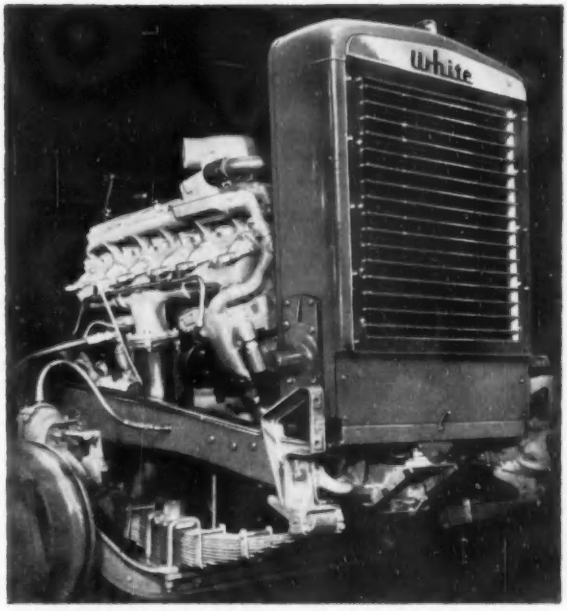
1930 About five years ago, Holt and Best merged for what might be called the second time to form the Caterpillar Tractor Company, with headquarters at Peoria. Their combined efforts are continually improving crawler and new attachments are being developed to increase its versatility. We are near Pittsburgh, Calif., and see a homemade sideboom attached to a crawler, laying pipe.



1931 This is the first diesel-powered crawler. A long awaited moment has arrived as engineers have been thinking in terms of diesel-powered crawlers since the late '20s. The diesel's inherent advantages—more power, greater endurance, and better economy—have made a good tool better. *(Dubbed "Old Tusko" by its present owners, this unit is still operating for a California lumber company.)*

1954 During the past 50 years, the crawler tractor has played an important part in the progress of our nation as well as in the development of modern construction methods. Here we see one of the latest crawlers. But this is not the end — development of the modern crawlers will continue. Tomorrow will bring improved units which will be bigger, better, and busier than ever.

WHITE'S short PAYLOAD TRACTOR



Looking at the new rig from this angle gives the impression that a vee-type engine has been installed. Actually, it is an in-line engine installed at an inclined angle of 20 deg.

PRODUCTION and delivery of the first Model WC-24TD tractors has been announced by the White Motor Truck Company. This is White's answer to current demands of the trucking industry for greater payload capacity, high horsepower and lighter, shorter rigs.

It is a diesel-powered unit of the conventional type with design and dimensions based on a 96-in bumper to back-of-cab length. This permits use of a 35-ft, square-nose trailer with a 10-in radius while still staying within the 45-ft legal limit.

A Model NHB Cummins diesel supplies the power. The engine is a 200-hp unit of 4-cycle, in-line design, developing rated horsepower at 2100 rpm. Bore and stroke for this 6-cyl unit are 5 1/8-in by 6-in respectively.

Fitting the engine into the desired cab dimensions made several changes necessary. A new frame and frame mount had to be designed. The new frame mount places the engine as far forward as possible while mounting it off to the right at an inclined angle of 20 deg. With this arrangement, the small projection, accommodating the rear of the engine is kept to the right hand side of the cab floor and away from the driver.

Although the front of the frame was lowered 8-in, standard height has been maintained at the rear axle. Dropping the frame lowered the center of gravity which improved vehicle balance, steering and riding.

Weight has also been cut. Aluminum cut the weight of the fuel tank, radiator shell, hood, bumper, crosswalk, and other components. Light-weight high-tensile steel was also used in a number of units to add strength while saving weight. Complete with fuel and fifth wheel, ready to roll, the tractor weighs 11,650 lb.

In designing the tractor, White engineers took into consideration the need for driver comfort as well as the necessity for accessibility where periodic maintenance is concerned. The wiring, air and fuel lines are all positioned and identified to permit quick checking. Air tanks and batteries are placed under the right running board to provide for easy servicing from the side. Outside accessories are also located so as not to interfere with engine accessability.

A side view points up the 96-in bumper to back-of-cab length. The tractor has a short, husky appearance.

The first 140 units have been delivered to Super Service Motor Freight Co., Inc., Nashville, Tennessee and are already going into the company's highway service to the eastern seaboard.

According to Mr. J. N. Bauman, vice-president in charge of sales for White, " . . . this unit is the first of a series of 'top cubage' tractors White will introduce to the highway transport industry this year . . . " White will make another model, incorporating a 175-hp diesel, available in the near future.

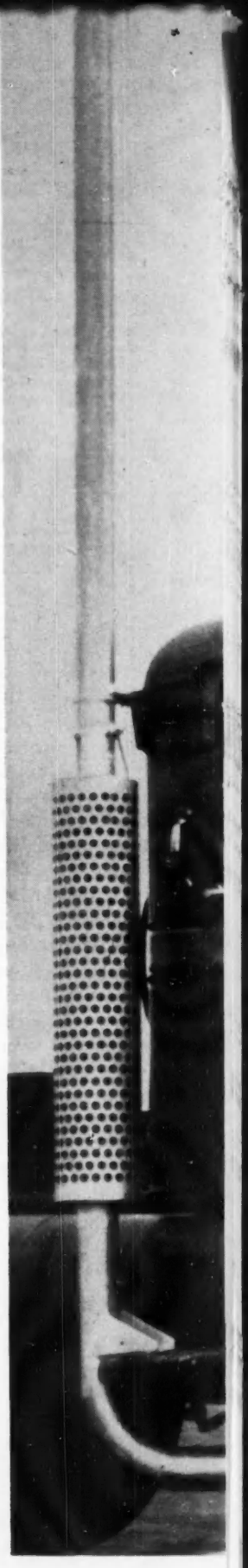
Vehicle Exhaust Noise

-An Industry Problem

THOSE from the Far East find their particular brand of music pleasant and melodious. To our unaccustomed ears, the same music may sound like the dissonant wails of a love-sick cat. One fellow can concentrate when surrounded by six children making like Hopalong fighting like a band of Indians. It drives another to the aspirin bottle. This all points up to the fact that human ears react differently. Sound level alone is not too significant; it resolves fundamentally to what frequencies and amplitudes individuals find objectionable.

That is why the transportation industry, particularly truckers, face a difficult problem. The problem does not lend itself to simple mechanical or scientific solution because of the many factors involved. The driver, the exhaust system and the condition of its components, space and economic factors, and always individual reaction play a part. Failure of all concerned to face the problem squarely has resulted in bad public relations for the industry.

Advances are being made and there is still more to be done. Presented here are abstracts of various papers presented at the SAE Transportation Meeting held last November in Chicago. Various viewpoints representative of the trucker, the muffler manufacturer, truck builders, and the engine builder will be brought out to show the nature of the problem, its causes, and progress toward its solution.



Evidence that the problem is receiving serious attention was shown by a paper presented by Mr. D. B. Callaway, supervisor of Sound and Vibration Control, Armour Research Institute. In it he quoted from a 1950 report to the Traffic Noise Subcommittee of the SAE Truck and Bus Committee to the effect that standard noise meters were inadequate for the job but that a special meter having three frequency channel driven by a single microphone would probably give more satisfactory results.

He said that in early 1952 the American Trucking Associations had met with Armour Research Institute to work out an approach to the problem. The result was a one-year research program with three objectives: (1) to develop a practical method on measuring truck exhaust noises using available commercial instrumentation to produce results substantially in agreement with loudness judgments by qualified listeners; (2) to obtain statistical data on loudness ranges of truck noise for all types of over-the-road trucks in different areas; and (3) to show that tests and noise measurements could be correlated with highway noise measurements.

The system devised was to record highway truck noises at selected spots using a magnetic tape recorder. Sound pressure levels at different frequency bands are determined at leisure by referring the noise to an octave band analyzer. The resulting calculations correlated quite well with the judgment of listening panels.

Conclusions reached were very interesting. First, it was concluded that commercially available instrumentation would yield good agreement with listening tests. Further conclusions served to point up the need for greater silencing efforts. West Coast trucks, for example, were found to average about 55 per cent louder than those of the Middle West. On the basis of accepting 80 sones at 50 ft from the trucks as a practical exhaust noise limit, it was found that 50 per cent of the Middle West trucks and nearly all large West Coast trucks require improved exhaust silencing.

Now let's look at different sides of the problem.

Truckers' Problems

Mr. Richard L. Hargrove, vice-president, The Liberty Highway Company of Toledo, in his paper to the SAE, had in part the following to say:

"For more than four years the trucking industry, through the American Trucking Associations, Inc., its spokesman, has been demanding a solution to the noisy muffler problem. We are still in trouble with standard equipment mufflers on commercial vehicles. The general picture on replacement mufflers is even worse than the original equipment muffler story.

"Vendors of replacement mufflers usually stress two features . . . either low back pressure or heavy-duty construction. The low back pressure muffler is usually a 'gutless wonder' with very low back pressure and a very high noise level. The heavy-duty construction mufflers are usually heavy and noisy. Permit me to cite a personal experience with a replacement muffler.

"In August, 1953, our tractor unit No. 2638 came into our Toledo shop for a new muffler installation, a result of an arrest in a South Bend, Indiana muffler noise drive. The muffler . . . was quite noisy and our records showed that it was a replacement purchased and installed on the road . . . We installed a back pressure gauge connection in the exhaust pipe and checked back pressure with GVW load of 52,000 lb at various speeds . . . Top back pressure registered was one-half pound.

"We then removed the noisy muffler and installed . . . an 'offset-through' type . . . which proved to be much quieter. We then tested back pressure under the same operating conditions as before and came up with exactly the same maximum back pressure reading . . . This test has convinced our maintenance organization and drivers that noise is not necessary for maximum power.

"There are a few muffler manufacturers who are trying hard to supply our industry with good, quiet, heavy-duty mufflers at a price that will be within reason, but too many of the manufacturers are still pushing the 'gutless cans' that have caused the bad public relations for our industry".

And what does the muffler manufacturer say to that?

A Muffler Manufacturer's Viewpoint

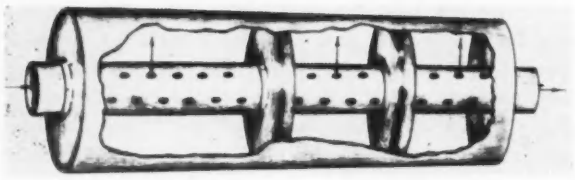
Mr. C. E. Nelson of the Nelson Muffler Corporation, in his paper added information on the general subject. First, he stressed that the exhaust noise silencing problems for commercial vehicles were no different for passenger cars and fundamentally could be handled in the same manner. He pointed out the need for cooperation between the truck engineer and the muffler designer to insure a well-engineered system for the particular unit involved. In view of the variables, interchange of a system among different units without modification is seldom possible without some loss of performance.

Mr. Nelson is all for a practical means of measuring exhaust noises as it would show that "we are well on the way to solve the problem and enforce limits legally." If exhaust noises were reduced until a listener reported them comparable to other truck noises, most public complaints would disappear, it was stated.

Muffler volume was held to be most important. In the 250-300-hp engine class, about 5000 cu in volume would produce adequate muffling without horsepower loss. A problem in many cases is to find room for the muffler and there is the matter of cost and competition.

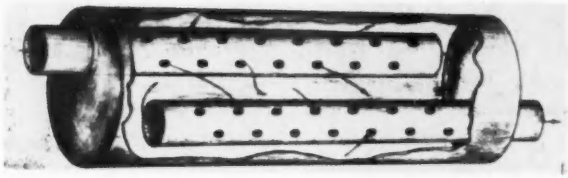
As to designs, Mr. Nelson stated that, basically acoustic designs fall into two categories: straight-through and the return-flow type. The first type was said to be usually unsatisfactory for low frequencies and in most cases necessitated objectionable stepping up of gas velocities to realize sufficient quieting. The offset of the exhaust and tailpipe in return-flow types produces an out-of-phase effect and reduces low and intermediate notes as well as the higher frequencies.

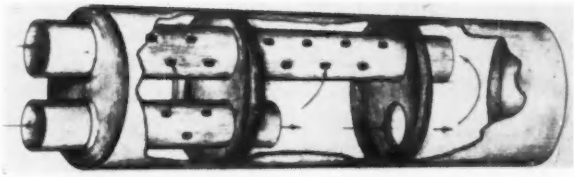
This type of muffler was said to be subject to greater heat transfer from the exhaust gases than the straight-



At left, the straight-through resonator type, usually unsatisfactory for low frequencys. In most cases, objectional stepping-up of gas velocities is necessary to realize sufficient quiting.

Courtesy Nelson Muffler Corporation





In the return flow type, as shown by the two lower illustrations, the exhaust and tailpipes are offset so that there is an alternate path for the gas to follow. This produces an out of phasing effect, reducing the low and intermediate note as well as the higher frequencies.

through type. Thermal shock and actual conditions existing in an exhaust system during operation are matters of concern to Mr. Nelson. He discussed a project undertaken with the University of Wisconsin wherein a 16-point temperature recorder was set up in a truck in normal service so as to obtain representative data.

Another project is being conducted under conditions similar to those in the field for the evaluation of various muffler materials. It was said that the coated steels show promise as a low-cost improvement of the high-temperature performance of mild steel.

So the muffler manufacturer has his side too. Let's see what the truck engineer has to offer.

Truck Manufacturer's Viewpoint

A portion of the blame for noisy truck exhausts was placed on the users by Mr. B. F. Jones, chief engineer, Autocar Division, The White Motor Company, in his paper. He scored impatient drivers who persistently "gun" their engines, with resultant exhaust roar, and also the fellows who "gut" the muffler, knocking out the baffles, in a mistaken supposition that more horsepower will be obtained. Another contributor to public complaints is poor condition of the exhaust system.

He confirmed the difficulty in measuring objectionable sounds and the need for improved instrumentation before it could be used for enforcement purposes. In this vein, he quoted Mr. Fred Lautzenhiser, chairman of the AMA Motor Truck Subcommittee, in a report dated June 16, 1953, to the American Association of Motor Vehicle Administrators, who stated that "the industry's position is that instruments would not be necessary for enforcement purposes if a standard were developed for original equipment and replacement mufflers."

Mr. Jones saw eye to eye with Mr. Nelson on three specific points: (1) that exhaust noise level was acceptable if not noticeably above the engine, fan, wheel, or windage noise of the moving vehicle; (2) that each engine has a characteristic sound pattern and exhaust system must be synchronized with it to obtain acceptable noise levels; and (3) that adequate size is important functionally although a headache from the where-to-put-it point of view.

Citing the improvements being made in original equipment, Mr. Jones brought out that there still remained the replacement muffler problem. Before cause for complaint could be eliminated, thousands of vehicles currently in use would have to be provided with adequate replacement mufflers.

Indicative of the fact that all truck companies are cognizant of the seriousness of the noise problem, Mr. Jones quoted data received from a number of them. He stated: "You will note particularly that none of the data is considered as final, nor is the list of manufacturers complete, but it indicates a definite trend toward ultimate solution of this problem."

GMC Truck and Coach Division, General Motors Corporation—Mr. C. J. Bock, chief engineer: "New models for 1954 will have the noise level of the exhaust reduced to the general noise level of the truck.

"To accomplish this we would have to increase the volume of the muffler and pay more for it, but we feel it must be done if we are to keep good public relations for the trucking industry. Mufflers have been increased in volume considerably for both gas and diesel vehicles. No mounting difficulties have been encountered. Our noise jury feels that new muffler sizes do a creditable job of silencing our vehicles and that if the exhaust systems

are properly maintained, there will be few if any complaints."

International Harvester Company, Motor Truck Division—Mr. W. D. Reese, manager of engineering: "At present two investigations are being conducted concurrently. One deals with the methods of recording engine exhaust noise on magnetic tape for jury appraisal of various exhaust systems. The other is a basic analysis of the effectiveness and efficiency of various muffling concepts.

"The study of recording techniques has included roadside exhaust noise recordings of moving vehicles, of engines equipped with a standard exhaust system operating on a dynamometer, and of a moving vehicle with the recording equipment mounted on the vehicle.

"Operation of the engine and exhaust system with a dynamometer gives the most satisfactory recordings, but simulation of highway operation is difficult. Evaluation of the various concepts of muffling began with an analysis of the sound to be muffled. This was done using various lengths of straight exhaust pipe with no muffler. It was determined that the lower frequencies present in the exhaust noise spectrum are in general harmonically related and dependent on engine speed and number of cylinders. There is a pronounced rise in output when there is excitation at the resonant frequency of the pipe, which varies over a wide range depending on average temperature of the exhaust gases.

"We have reason to believe that much of the annoyance factor in exhaust noise results from the higher frequencies (100 cycles per second and up) which are not harmoniously related. Our first approach concerns attenuation of the lower frequencies through the use of resonant principles. As yet, few firm conclusions can be drawn regarding noise abatement."

Mack Manufacturing Corporation—Mr. F. R. Nail, assistant chief engineer: "Our physical problems are much the same as for all truck builders. For underframe installations, muffler lengths are limited by short-wheel-base requirements; diameters are limited due to amidship transmissions and fuel tanks; weights are limited by the operator, and of course the cost is of primary importance. Being thus limited in volume, the noise level is considerably affected by back pressure. These restrictions combine to leave the designer with very few compatible compromises.

"During the past five or six years, considerable work has been done to find the best answer to these requirements, and progress can be illustrated by the following examples:

"1) Trucks and tractors with 200-hp diesel engines. We are now using an 8½-in diameter by 35-in muffler with acceptable results. As further improvements, we have now developed an 8½-in by 60-in muffler of the interrupted-flow type which has affected a 30 per cent reduction in noise level. No increase in back pressure and no sacrifice in life of muffler has been experienced although cost is considerably higher.

"2) On large COE models with 200-275-hp diesel engines, we have developed a new 6 by 14 oval section muffler, 60-in long, porcelanized, of the interrupted-flow type. Noise characteristics indicate objectionable levels are 50 per cent lower than with former 8½ by 35 round muffler.

"3) 170-hp diesel. We are using the same muffler as for the 200-hp gasoline engine with excellent results.

"All work insofar as noise level ratings are concerned, has been done on the basis of jury judgment. In addition to this, wire recordings have been taken for further analysis. Decibel readings are definitely misleading and have been found useless as an an index to acceptable muffling systems."

Diamond T Motor Car Company—Mr. R. C. Wallace, executive engineer: "Volume has the greatest effect in silencing mufflers and on one of our units using the 200-hp diesel we have gone to a 9-in diameter by 45-in long unit. This has been accepted as good on the Pacific Coast.

"We are very conscious of the public's reaction on noise and are setting up to run a complete recheck on our whole muffler program. It should be possible to develop a standard muffler location for diesels as there are some states which will not permit vertical stacks and others which require them. This situation should be standardized."

Kenworth Motor Truck Corporation—Mr. R. C. Norris, chief engineer: "Noise reduction has to be accomplished for two conditions: a steady pull and a quick change in engine speed when shifting gears. In our opinion, the most objectionable noise is the cracking sound that some exhaust systems give at gearshift changes. It appears that an increase in volume of the muffler is necessary to secure good noise reduction characteristics. The position of the muffler in the system has a definite effect upon its characteristics. Other portions of the truck control the position of the muffler so that it is seldom possible to take advantage of this point.

"With the continually increasing horsepower required

GM introduced the "Silent Power" exhaust system with its '54 line. Below is the old style muffler for the 503 cu in engine, while above is the 1954 muffler for the same engine.

for the various trucks, the additional space required for the muffler must be taken away from either the body space or the driver. In our cab-over-engine design, we have found it necessary to put a pocket in one corner of the cab in order to provide space."

Autocar—"Recent investigations and tests of a number of muffler types have resulted in the adoption of a larger muffler than the one formerly used. This has materially reduced objectionable noise previously experienced and has also resulted in lower back pressure. However, tests and research are being conducted in our laboratory and on the road in an attempt to further reduce the noise level to that of other sounds given off by a vehicle on the highway."

An engineer supplied the following information, which, Mr. Jones feels is very pertinent to the question at hand.

"Due to the fact that every engine has different sound characteristics, it is necessary to silence the engine by means of a muffler tuned for its exhaust. Simply increasing the muffler's volume is not the answer to this problem.

"In the absence of satisfactory instrumentation and established minimum acceptable noise levels, most test work has been done by the aid of listeners' juries. By means of this type of test work, a satisfactory muffler was produced which, while 60 per cent longer than the standard muffler, permitted adequate tuning chambers to be included. These chambers of relatively simple design are effective silencers.

From these comments it is seen that the principle points of concern are size, weight, cost, service life, and restriction to gas flow in the mufflers. The factors are not at all compatible. A small muffler might silence satisfactorily but at the expense of increased back pressure. Why is this so bad? Let's see what the engine builder thinks about it.

Engine Builder on Back Pressure

Mr. M. L. Fast, supervisor of Test Engineering, Cummins Engine Company, gave some pertinent information in his paper as to why engines are not tolerant of excessive back pressure. An abstract of his paper is given below.

"The basic cause of engine exhaust noise is, of course, the pressure wave set up by the sudden release of high pressure gas by the opening of the exhaust valves. This pressure wave has a very sharp front and is thus capable of exciting all parts of the exhaust system regardless of their own natural frequency.

"These pressure waves occur at all operating speeds and loads, the amplitude being, of course, principally affected by load. At certain speeds the number of pressure waves will correspond to the natural frequencies of the column of gas in the exhaust system. These periods of resonance are distinctly noticeable when the engine is accelerated throughout its speed range and are one of the major problems in designing a satisfactory muffler.

"The pressure waves will also be transmitted to the atmosphere through the walls of the exhaust system. This is 'shell noise' and is due to forced vibration of the containing walls of the exhaust system such as the exhaust manifold, exhaust pipe, and muffler. Still another source of exhaust noise transmission are any leaks in the exhaust system such as leaking manifold gaskets, split or burned-out exhaust pipes or mufflers.

"Some effects of excessive back pressure are widely recognized. Most small boys know that a potato pushed onto the end of the tail pipe will make your car inoperative. Truck drivers know that a high restriction muffler reduces their power, hence the "crowbar treatment".

The higher the exhaust back pressure, the higher the gas pressure over the piston during the exhaust stroke, and consequently the higher the pumping friction or horsepower loss in expelling the exhaust gases from the cylinder.

"At the end of the exhaust stroke the exhaust gas that remains in the clearance space is of relatively high temperature and if under pressure, will be expanded during the suction stroke. This expanded exhaust gas occupies space otherwise available for fresh air.

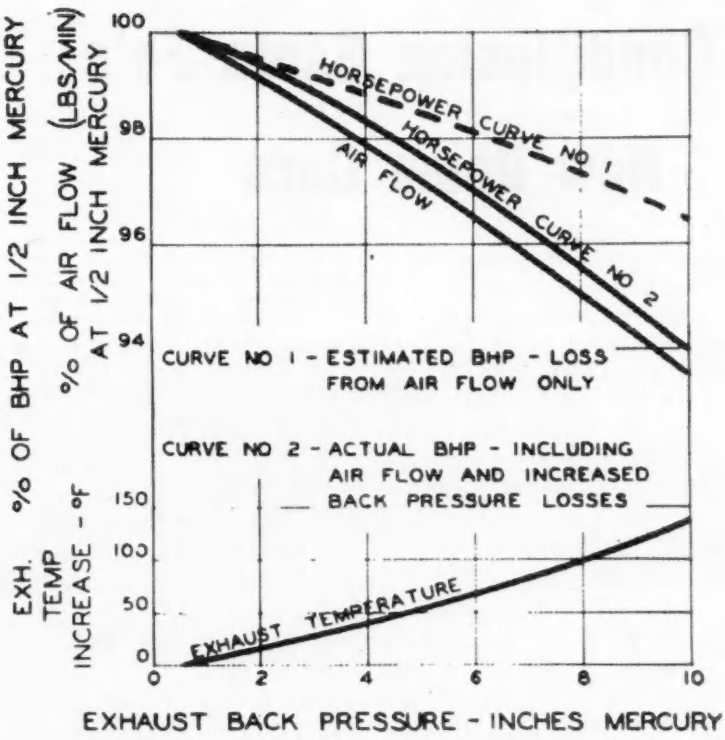
"The heat of residual gas is absorbed by the incoming air, raising its temperature. Consequently, increased exhaust back pressure manifests itself in two ways: (1) increased friction horsepower reducing the mechanical efficiency of the engine, and (2) diluting and increasing temperature of incoming air which reduces the pounds of air available for combustion.

"The curves on the Figure show the percentage effect on engine performance of increasing the exhaust restriction from ½- to 10-in of mercury. The ½-in values have been taken as 100 per cent performance for this comparison. The bottom curve, labeled "Exhaust Temperature", shows an increase of 130°F due to the increased back pressure. The air flow curve shows a loss of 6½ per cent in pounds of air consumed by the engine per minute. The No. 2 horsepower curve shows a total loss of 6 per cent due to the effect of 10-in back pressure on engine pumping losses and air flow. The No. 1 horsepower curve was estimated as the power output based on the actual air consumption but does not include the increase in pumping loss. So at any given back pressure, the difference between the No. 1 and No. 2 curves represents the increase in pumping loss due to that back pressure.

"The intake manifold pressure of the supercharged engine can be made sufficient to sweep the exhaust gases from the cylinder during the time of intake and exhaust valve overlap. Thus it is possible to minimize the dilution or temperature effect of the residual gas but the pumping loss remains. Actual tests have shown that increasing the back pressure produces a loss in both naturally-aspirated and supercharged engines, with the latter being the least sensitive.

"Since this loss in horsepower is in part due to a decrease in volumetric efficiency, it necessarily follows that it will be accompanied by an increase in exhaust smoke and exhaust gas temperature. There will also be an increase in the brake specific fuel consumption.

"Actually, increased exhaust gas temperature is the



Exhaust back pressure effect on the performance of a Cummins engine operating at 2100 rpm.

result of an increased temperature level of the entire operating cycle. If excessive back pressure is permitted for any considerable time, service life of the engine will be impaired. Some troubles which might be expected are: (1) warped or burned exhaust valves; (2) manifold cracking and increased oxidation; (3) burnt head and manifold gaskets; (4) burning and sticking of pistons and rings; (5) possible cracking of cylinder heads; (6) increased carbon and sludge in crankcase.

"Based on our experience with these problems, we specify that the back pressure on our engines is not to exceed a maximum of 1-in hg on a naturally aspirated engine or 1½-in hg on supercharged engines. This pressure is measured in the exhaust pipe 1½ in back of the manifold flange. Satisfactory mufflers are now commercially available which will meet these back pressure specifications if they are properly installed.

"Due to the usual space limitations, it may be more difficult to obtain a satisfactory installation than a good low-restriction muffler. The best conditions will be obtained with smooth continuous flow with no sudden changes of cross sectional area or direction. The number of turns must be kept to a minimum and large radius elbows used if at all possible. These elbows should be tube bends since welded elbows give much higher restriction. Welded right angle turns should not be tolerated.

An exhaust system designed and installed to provide the lowest possible exhaust back pressure is a sound investment toward securing best operation of the engine and will pay for itself in reduced fuel consumption, decreased maintenance costs, and greater availability.

Conclusions

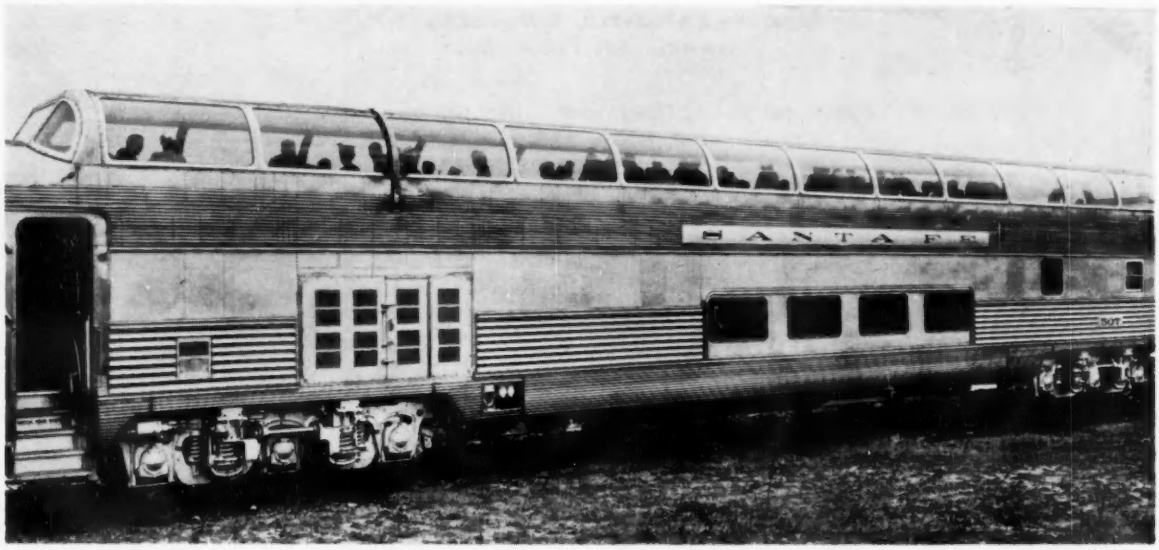
From the foregoing we must conclude that there is a real problem and that in addition to a genuine awareness of this fact, progress is being made toward a solution. The first avenue of approach is to investigate the nature of exhaust noises—particularly the most objectionable components—and to provide better measurement of them through improved instrumentation.

Mufflers of suitable design and of larger size are available and will do the job. Their use involves space, weight and cost problems. The first two items are the designer's job and will require considerable ingenuity. The last item —cost—is a tough nut to crack. After the best technical efforts to keep costs in line, it will be necessary to "sell" the user on spending a little more to lick a troublesome longrange public relations problem.

Another educational phase will concern operational and maintenance aspects. Operators must understand that full power can be obtained with the proper muffler setup and that a "gutted" muffler serves no useful purpose. Muffler systems must be maintained in good condition to be effective.

Better designs are continually being sought and the use of coated-steels shows promise of greater service life. This could go a long way toward solving the higher cost of larger, more efficient mufflers.

Air Conditioning Santa Fe's New Dome Cars



Full-length dome cars are fine for greater scenic observation. But how to keep the passengers comfortable in extremely varied temperatures, humidity and altitudes? The solution was found in a diesel-powered 20-ton capacity air conditioning plant.

SANTA FE has a whopper of a "greenhouse" on their 14 new full-dome cars being built for them by the Budd Company. Such enclosures are fine for observation —scenery never looked so good—but glass is a two-way proposition. The sun load can be terrific. Add to this the temperature variation encountered over the Santa Fe's routes, the changes in humidity, and altitude differences. Then you can see why Budd engineers faced a special problem in getting passenger comfort in these cars.

They came up with the idea of using a diesel generator set in each car to provide the necessary power for complete air conditioning, for modern car lighting, and powering other electrically-operated conveniences in the car. The unit selected was a 70-hp Caterpillar D315 diesel-electric set. The 220-v, 60-cycle AC generator produces 40 kw at an engine speed of 1800 rpm.

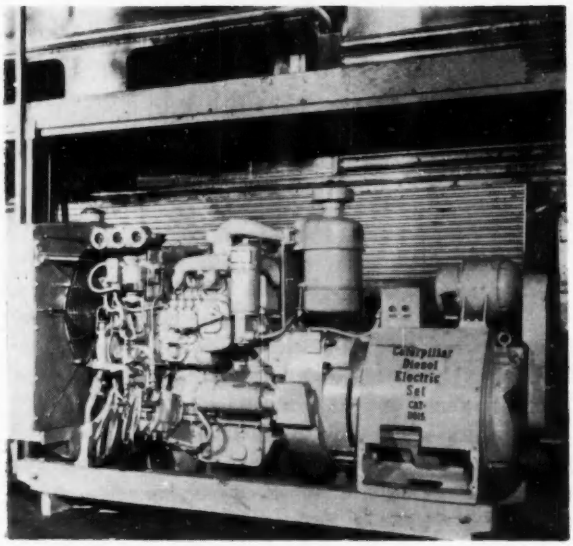
AC Power Advantages

Use of high-voltage AC power to this extent is a somewhat new idea. It has proved advantageous to the electrical equipment designed for use on these cars. First, compactness was attained because smaller, lighter electrical cables and conduits could be used. Secondly, the size and weight of compressor, evaporator and condenser motors to power the two Trane air conditioning units could be much smaller. Third, the weight and space which would have been required for batteries when using an axle-driven DC generator could be reduced by more than 80 per cent. Then too, each car would have an independent electric power source which could be in operation all the time regardless of whether the car was moving or not.

Machinery Arrangement

Car balance was worked out by separating the air conditioning equipment and the generation unit. The Cat generating set is placed in its own engine room on the main deck at the forward end of the car. The air condi-

At left, one of the new dome cars. The diesel-electric set shown below is installed near the left end of the car. The exhaust pipe, upon leaving the engine compartment, follows the contour of dome.



tioning equipment is housed in a similar room at the other end of the car. In both cases ample room is provided for easy maintenance from within the car even when it is in motion.

Engine Room

Frequent maintenance operations such as filter changes, etc., have been simplified by mounting all of the serviced components on the most accessible side of the unit. If the opposite side needs attention, the unit can be rolled to the outside wall of the engine room without difficulty. This is made possible because the set is mounted on a base resting on tracks. Accessibility is carried a step further by provision for rolling the entire unit outside of the car onto a special table supported by two steel cables. This insures complete accessibility.

The electric sets, being self-regulated, completely eliminated many electrical maintenance features. No rheostat, voltage regulator or similar regulating devices are needed because the design and construction of the generator are such that the voltage variation between no-load and full-load is well within the limits suitable for operation of the electrical equipment contained in the cars. Since the entire set is a standard production model, parts or service should present no problems to the railroad.

Air at the rate of 10,000 cfm is circulated through the engine room. It is drawn through filters in the louvered doors, pushed with the radiator fan to an air discharge plenum where it exits through a grill in the floor. A large radiator was installed on the D315 unit to handle the 120°F ambient temperature expected in the western deserts. During winter months, a steam heating system maintains a constant 50°F temperature in the engine room.

The entire unit is supported on Lord rubber dampers which isolate any vibration that might occur. Engine room walls are of perforated paneling backed with fiber glass insulation which eliminates sound completely when the train is in motion.

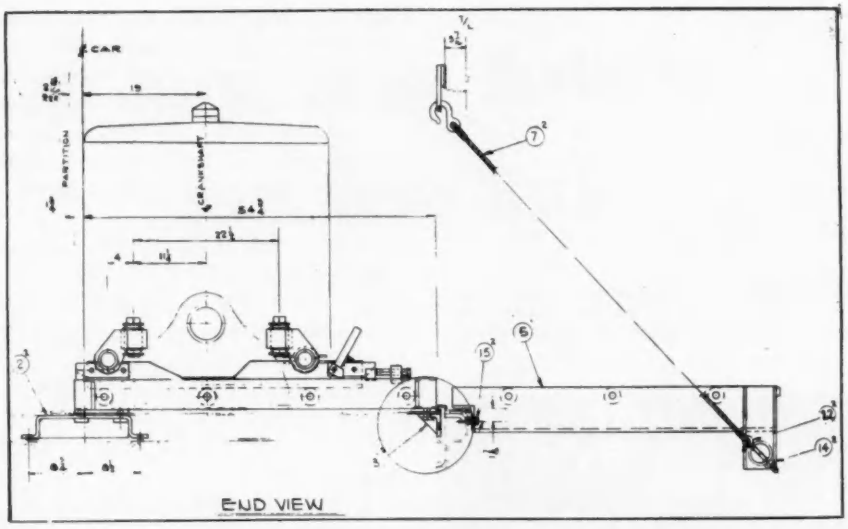
A 200-gal fuel tank, holding twice and more the amount of fuel needed for a trip from Chicago to the Coast, is located towards the center of the car, some 35 feet from the engine. While this is a simple move in the direction of safety, Santa Fe safety engineers went much further by installating an automatic system to guard against abnormal heating of equipment. It consists of a carbon dioxide flooding system triggered by a set of repeatable fire-and-overheat detectors. The system, designed by the C-O-Two Fire Equipment Company, acts to flood the compartment and shut down the generating set by a pressure-sensitive switch if temperatures exceed the highest expected compartment temperature by 50°F. Pull boxes are also provided.

Air Conditioning Room

The Trane air conditioning equipment in the after compartment consists of two 10-ton compressors each driven by a 15-hp, 220-v, 3-phase motor. They have time-delay starting devices to prevent excessive starting loads on the generator. There is also a 20-ton full-flooded condenser constructed with two 10-ton coils with a single motor-driven fan and separate motor-driven pumps and sprays for each coil. Two 8-ton evaporators are equipped with heating coils. Evaporator coils are split in 4-ton sections, two of these sections being part of a 10-ton compressor system. Each of the two evaporators delivers air to its half of the upper deck through a special three-way duct normally open in the cooling season, but with provision for blocking the two side ducts when heating.

Controls

There is nothing to starting the diesel-electric set. It can be started from a switch locker at the end of an adjacent passageway or at the engine itself. As a safety feature, there is a blocking switch at the set that locks



Detail drawing of the special Budd-Designed base and cable-held table on which the entire engine-generator set may be rolled.

out the remote control when work is in progress on the unit.

The air conditioning and heating equipment is automatically controlled. Three "solar discs" (like three automobile dome lights upside down) are located in a stainless steel fitting in the top of the dome.

These automatically control the heating system and also the cooling system to adjust for sunny and cloudy summer weather. One senses outside temperature and speeds up air circulating fans as temperatures climb above 85°F.

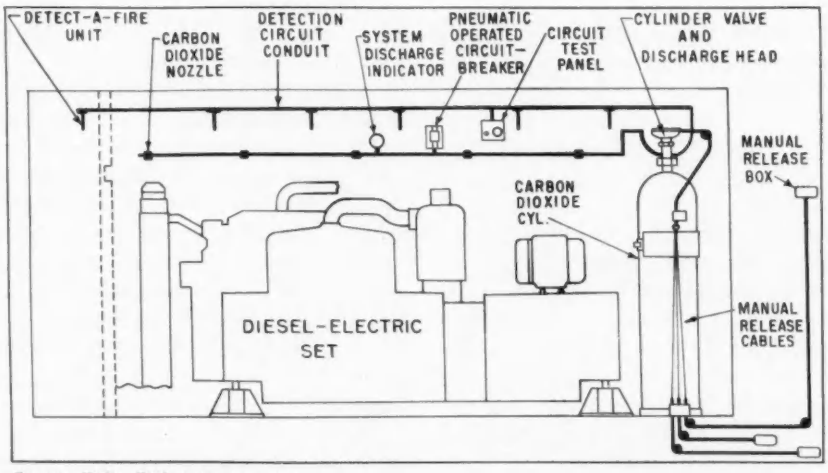
One ingenious device minimizes the heat that would normally be transferred through the large glass area. Anemostat air outlets direct a curtain of cooled air so that it follows the contour of the curved glass. This provides a cool air curtain between the passengers and the glass.

Other Power Uses

An elaborate lighting system was arranged to give different effects. Softly diffused fluorescent lighting is used in the dome section to give passengers a "starlite" effect without restricting their outward view. In the lounge section of the dome and on the lower deck, spotlights are aimed at the tables.

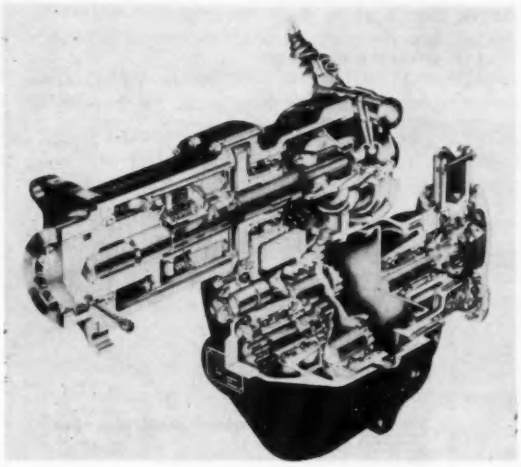
Mechanical refrigeration is another power use. It is used in the bar on the lower deck. A public address system is also installed. An electrically-operated dumbwaiter provides service in the dome.

The unparalleled observation plus the high degree of comfort and service provided should attract a great many passengers. This is the objective, but underlying its achievement is a lot of competent engineering. And the whole thing was made possible by the same thing that put a great many railroads back on their feet—diesel power.

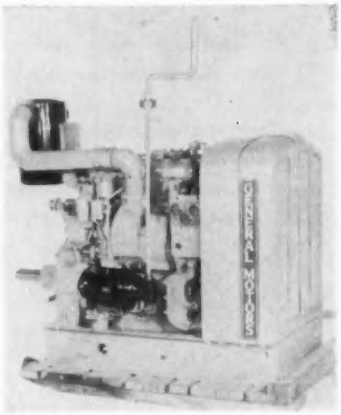


Courtesy Walter Kidde & Company, Inc.

Schematic layout of the integral automatic fire detection and extinguishing system in the generator compartment.



Bendix International has introduced an inertia starter suitable for use with the smaller diesels.



At left, a cutaway view of the unit. A typical installation is shown above.

INERTIA STARTER

REMEMBER the inertia starter once commonly used for starting aircraft engines? Well, the principle has been revived and a unit designed for use with the smaller diesels. Although originally engineered specifically for application to the 2-, 3-, 4-, and 6-cyl General Motors Series 71 engines, these starters are also suitable for use with many other engines of comparable displacement. Here is how they work.

Nothing is needed other than the crank. You simply insert the crank and start turning, accelerating progressively until approximately 80 rpm is attained. At this point, you have built up suffiicient stored energy in the unit to start the engine; but let's look at what has been taking place inside the unit. As you turned the crank, the energy applied over the 60 or 90 seconds it took to get up to speed was accumulated in the inertia wheel. This was done through a speed-increasing gear train connecting the crank to the wheel. The stored energy is the source of power for starting the engine.

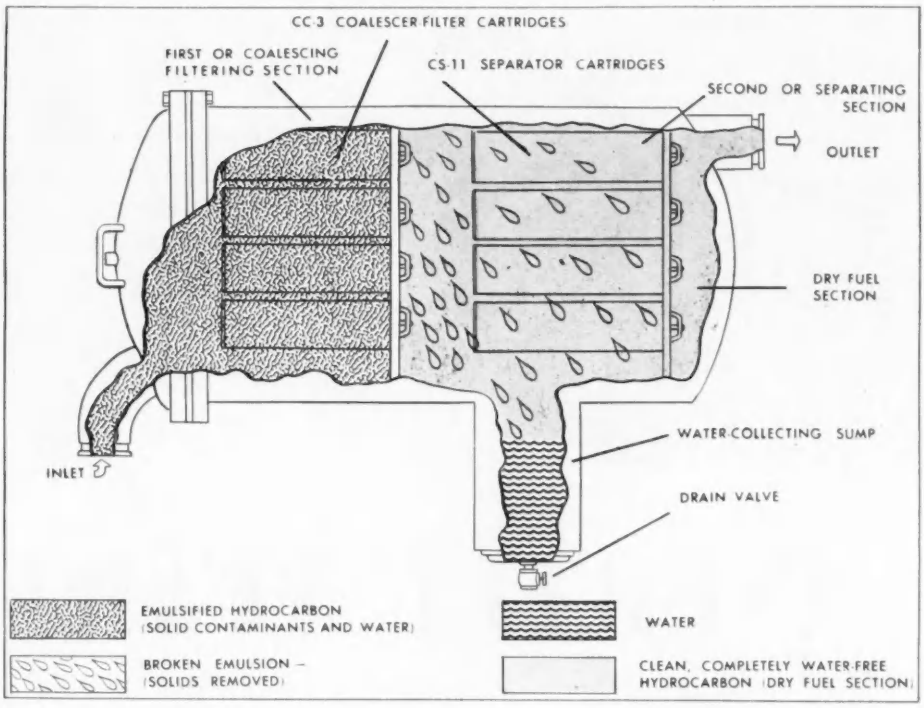
Next, the stored energy must be transmitted to the engine flywheel. A train of speed-reduction gears and the starter drive pinion, engaged by a hand-operated lever, take care of this step. To protect the flywheel ring gear and the starter mechanism against overload or "backfire", a multiple-disc clutch of conventional design has been incorporated into the final drive between the inertia wheel and the drive pinion. The clutch is pre-set at the factory and the load rating stamped into the starter nameplate.

A friction ring located between the final drive gear and the drive shaft, together with a spring-loaded meshing device, has also been incorporated to assure smooth, rapid, and complete meshing of the pinion with the flywheel ring gear.

The starters are available with either a straight or right-angle crank handle take-off. This arrangement allows the crank handle extension to be placed in a location which will not interfere with engine accessories, etc. In addition, the pinion housing, engagement lever housing, and crank handle take-off, may all be oriented to any position within the limits of the bolt spacings. This, too, allows flexibility in mounting to avoid interference with any obstructions on the engine. The engagement lever may also be positioned on its shaft for the most convenient location.

Also available in either clockwise or counter-clockwise rotation, the inertia starters are mounted with an SAE flange using the same three 5/8-in cap screws as used with a conventional electric starter. A grease fitting is provided for the lubrication of the engaging pinion only, as the starter is internally lubricated and sealed when assembled at the factory.

Fundamentally, the inertia starter provides a means of storing mechanical energy applied at low torque over a relatively long period of time, and releasing it at high torque for a shorter period. This serves to extend the advantages of manual cranking—simplicity and lack of reliance on any outside mechanical or electrical power source—to larger engines. This suggests a number of logical applications, including those in remote areas and those where electrical starting equipment might constitute a hazard.



How Fram's Separator - Filter Works

Separation of water from fuel oil is highly desirable. So is filtration. Here is how a new combination unit functions to perform both of these necessary jobs.

IT'S easy to get water into fuel oil and much harder to get it out. The harmful effects of water in the injection system, particularly in the form of slugs, are well known. It ranks well up with dirt as a major enemy of injection equipment in which even relatively minor amounts of corrosion and wear are not to be tolerated.

The best solution is to keep water out of the fuel supply. Most of it is introduced during handling and storage, so this is the area where maximum precautions should be taken. Be sure that storage containers or tanks are free from water. Protect drums and other containers from the

Exterior of one size of separator-filter unit. Gauges measure overall pressure drop. Note air eliminator at top and water level gauge in the water-collecting sump. Flow through the unit and the action in each section is shown in cutaway above.

entrance of rain, and keep tanks as full as possible in fluctuating temperatures to reduce condensation.

However, sometimes the best of precautions will not eliminate all water and frequently, practicalities prevent maintenance of ideal conditions. Water is there and you have to do something about it. Centrifugal separation has been used effectively and some types of filters will partially remove water, although sometimes to their own detriment. A lot of thought has been given to finding a method of water separation based on the simplicity of the filter while having the effectiveness of centrifugal separation.

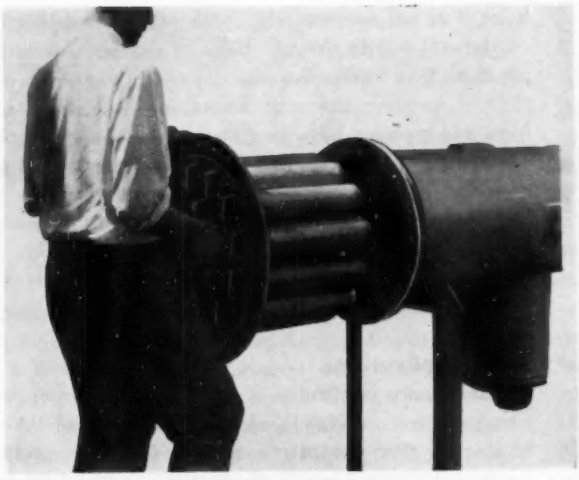
Working along these lines, the Fram Corporation developed some large combination liquid separator-filter units that have been tested and approved and are now in use by the government as well as large commercial producers and users of liquid hydrocarbons. The Navy is using some of these effectively in carrier service.

Naturally, these are very large units, but the principles involved have been applied to a broad range of sizes down to units practical for the smaller diesel engines. Those for engines up to 225 hp are built at, and sold from, Fram's Providence, R. I. plant, while the larger ones come from Fram's newly acquired subsidiary, Warner Lewis Company at Tulsa, Okla. Now, just what are the principles involved and how do the units work?

How They Work

Operation of the units is based on a proven scientific principle which utilizes the forces of interfacial tension and preferential wetting to break and then completely separate the tight mechanical emulsions of immiscible fluids. Fram's exclusive patented process uses a two-stage unit to remove both solid contaminants and water from fuel.

The two stages, arranged in series, involve two sets of filters using replacement cartridges. The first-stage coalescing-filtering media consists of a plastic-impregnated cellulose cartridge which is dimensionally stable in water. This element performs two functions. First, it acts as a filter for solid contaminants such as rust and gum; and second, it acts as a coalescer or emulsion breaker.



Installing one of the standard coalescer cartridge assemblies in the casing. The assembly of heavy-duty cartridges is similarly installed.

Finely-entrained dispersed water entering the coalescer unit is broken down into large water droplets during its passage through the porous media. Dirt and other solid contaminants are filtered out. The free fuel and the large droplets of water then pass on to the second stage unit where some of the water drops out by gravity. The remaining water is repelled by the separator cartridge, which is chemically treated to assist the forces of interfacial tension and preferential wetting, to allow free passage of fuel through the capillaries of the porous membrane while preventing water passage. The fuel, now cleaned of both solids and water, then passes on through the filter outlet.

Characteristics

In appearance, these units do not differ to any great degree from conventional filters. In fact, the similarity goes a lot further. Flow characteristics at normal pressures can be determined in the same way, being a function of the total area (number of cartridges) and the viscosity of the oil. With No. 2 diesel fuel, for example, nominal flow rates from 20 gph to 500 gpm can be obtained by selecting standard units with the required number of cartridges.

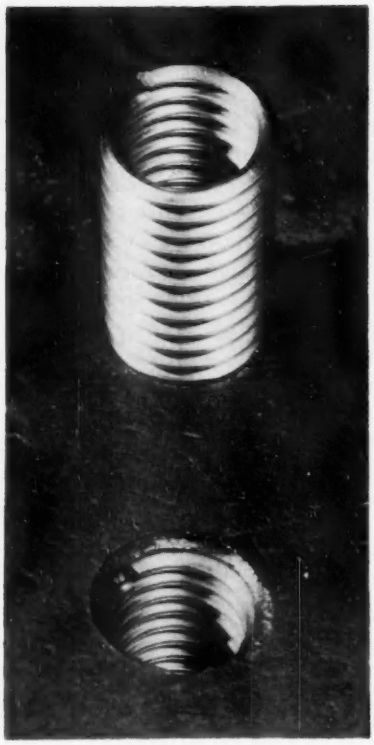
Contaminants down to 5-micron size are removed by the filter element. In addition to the standard elements, heavy-duty cartridge assemblies are available for use where a high degree of fuel contamination is expected to cause difficulties. Initial pressure drop will be determined by the same criteria as for conventional filters—size and flow rate. Coalescer cartridges should be changed when the pressure drop across the whole unit reaches 25 psi. Separator cartridges are replaced when the drop across them reaches 5 psi, or at least once a year.

Methods of draining the separated water range from simple manual drain cocks to automatic controls that maintain a maximum water level. The larger units may also incorporate automatic air eliminators to assure full emersion of all the coalescer and separator elements.

Some Results

Field reports indicate that the unit is very effective in removing water from the fuel. In one case, seven quarts of water was deliberately added to 25 gal of diesel fuel in the tank of a bus. Arrangement was made to collect all of the water separated.

After a run of approximately 95 miles, including some stops and waiting, the bus was returned and the accumulator tank checked. It was found to be completely full, indicating that separation had been effective. Following normal servicing, the bus was put in regularly scheduled service. At no time during the test or later in service was any performance difficulty experienced.



Worn and damaged threads can be repaired with wire inserts. You save the cost of a new part with the bonus of preventing other failure of the part itself or the associated assembly.

Thread Repairs Save You Money

Fig. 1— A view of the thread inserts, prior to and after installation.

A LOT of things can happen to a thread. It can wear, corrode, chip, strip, seize and you can ruin it by cross-threading. When any of these things happen it may be necessary to discard parts that are otherwise usable. The strength of an assembly often lies in its fastenings and if these fail there is no alternative to replacement of the offending part except to jeopardize the whole assembly.

Sure, there are expedients. You can use oversize bolts, capscrews or studs—if there is enough stock, if you are satisfied that there is no structural weakening, and if you don't mind the loss of interchangeability. You can fill the hole with weld metal and then drill and tap it—if you have the equipment, if you can tolerate any heat distortion or are prepared to do any necessary remachining, and if you are sure you can maintain alignment. You can rebush it—if you have the tools, if you can maintain the proper fits, and if you want to take the time and trouble.

Then you can do it much easier and faster with a little coil of wire and a few special tools, which is what we started to tell you about in the first place. There is nothing new about these wire inserts, Heli-Coil Corporation of Danbury, Conn., has been knocking them out for years. It's just that applications in the diesel field may be new to you or perhaps you never get around to thinking of them in terms of your work.

The repair process is simple, involving three steps. It is applicable to either shop or field repair, at regular overhauls or at spot troubles. The idea is to form new threads by interposing a precision-formed wire coil between the base metal and the fastener.

Step 1. A standard drill in a size no greater than the major diameter of the original thread is used to drill out the damaged threads.

Step 2. The hole is retapped according to specifications using a Heli-Coil tap. The thread lead will be exactly the same as that of the original fastening but the outside diameter will be slightly greater.

Step 3. An insertion tool turns (clockwise) the insert into the retapped hole. When the inserts are used in blind holes it is not necessary to break off the inserting tang on the coil but in through holes, it can be broken with pliers or tang break-off tools.

Once in place, the wire thread inserts will not work loose and repeated tests have shown that the new threads can withstand a minimum of 25 per cent greater load than unprotected tapped threads in the same materials. This is because these inserts automatically adjust themselves to the threads in the hole and on the bolt. This distributes the load more evenly and avoids concentrations on two or three threads as frequently occurs.

Some Applications

Maintenance mechanics of the Colonial Sand & Stone Company, Inc., of New York City have reduced the cost of keeping their company's equipment in A-1 condition by the use of these inserts. Periodically, each of the company's 400 heavy-duty road vehicles is disassembled for

inspection and reconditioning. Threads in tapped holes of all parts are inspected for wear, and if worn beyond manufacturer's minimum specifications, are replaced with inserts.

When fastenings of operating elements of field equipment (conveyors, draglines, scoop shovels, etc.) develop excessive play the maintenance department is notified and thread repairs are made immediately on location. Worn threads invite breakdowns.

Worn threads are sometimes found in their diesel engine clutch housings. Eight 5/8-18 capscrews in tapped holes in the block must withstand starting torque when the driver engages his clutch. When reconditioned with inserts, capscrews holding the housing to the engine block can be tightened with enough torque to prevent movement, wear and eventual thread failure.

A frequent repair point is the valve housing of the airbrake system. Threads tapped in the aluminum housing often strip during disassembly or reassembly for overhaul and repair. When these go bad they are replaced with 5/16-18 inserts.

Worn threads in the power flanges of the engine crankshafts are also repaired by thread inserts. Sixteen 1/2-20 capscrews join the crankshaft to the clutch assembly. Repeated changes in engine torque apparently cause these threads to wear at an accelerated rate until failure causes truck breakdown. It is standard procedure to inspect these threads carefully during overhauls and to repair any that are found unsatisfactory.

In field repairs these inserts prove extremely valuable when housings of power take-offs get loose from overloads or vibration. Worn threads will frequently prevent capscrews from staying tight. Looseness permits harmful movement between the parts and if not corrected will cause breakdown.

The process of repair is so simple that not much space is required for it. Bell housings, for example, can usually be shifted to one side enough to give access to threaded holes requiring repair. They can be drilled, retapped and the insert installed right on the spot with a minimum of disassembly. The amount of stock removed in the retapping operation is so slight that repairs can be made in thin sections where oversize fastenings would not be practical or possible.

Colonial's mechanics have had such good success with these inserts that they have assembled a selection of inserts, taps and inserting tools into kit form. In this way they are ready for immediate use whenever a worn or stripped thread is discovered.

A Special Use

Cylinder head castings, ordinarily scrapped due to seized threads, are now salvaged with wire inserts in Caterpillar dealer and repair shops. When seized screw-in type precombustion chambers are removed, the threads in the head casting are often damaged. Although these heads might be usable in other respects the damaged threads were cause for discard. Now they are repaired.

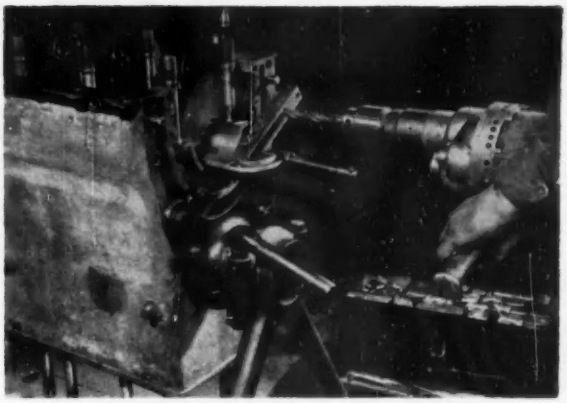


Fig. 2—The first step is to drill out the hole to a size no larger than the maximum diameter of the threads.

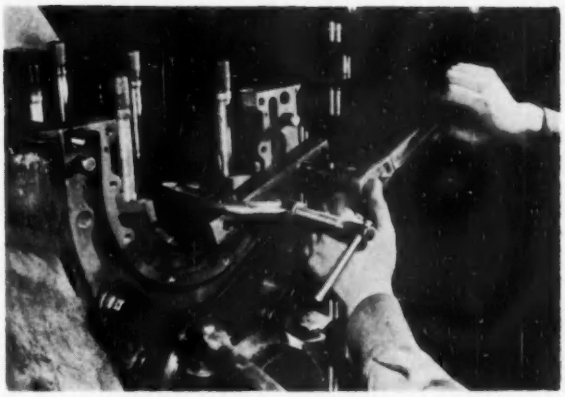


Fig. 3—After drilling, a special tap is used for retapping.

Fig. 4—Using an insertion tool for the final step, the thread insert is turned into the retapped hole.

Installation of the inserts is accomplished in the following manner:

Step 1. After the precombustion chamber is removed, gasket taken off, and seal cleaned, a drill guide (See A of Fig. 5) is inserted into precombustion chamber opening to position the drill (Fig. 6, left). Make sure that bottom of drill guide is properly seated in gasket counterbore.

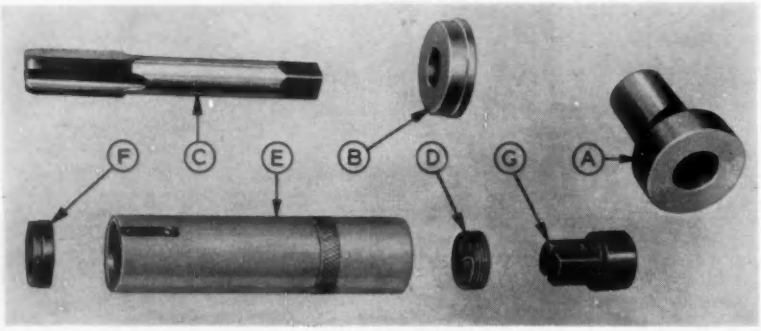


Fig. 5—Tools for a special job: A—Drill Guide B—Tap Guide C—Tap D—Insert E—Sleeve Assembly F—Prewinder G—Nib

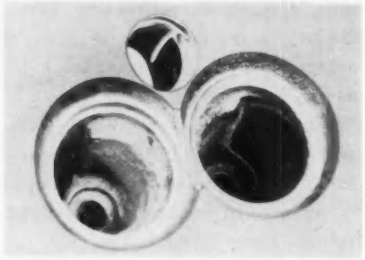


Fig. 8—The finished job looks like this except that the insertion tang must be broken off.

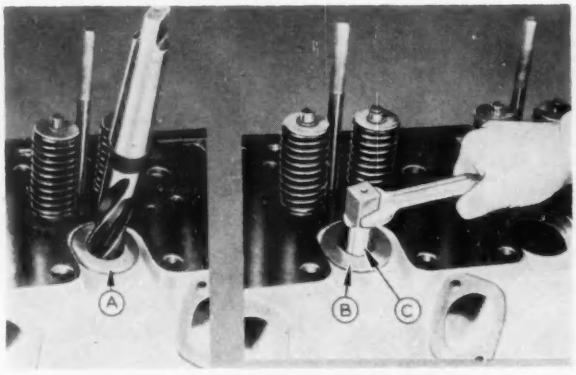


Fig. 6—Drill and tap guides are necessary in this operation since the insert is placed near the underside of the head, while working through the head from the top side.

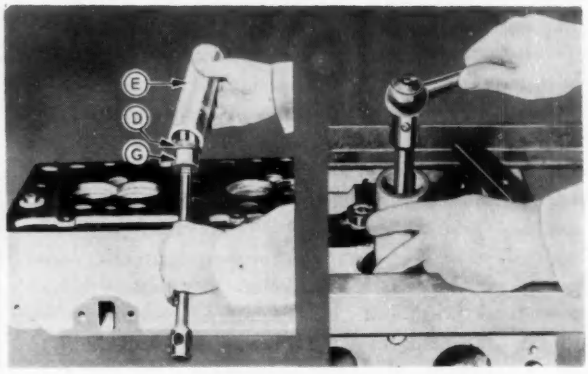


Fig. 7—To complete the operation, the prewinder, sleeve assembly, insert and nib are assembled on the drive wrench and the insert turned into the hole.

Step 2. Drill out the damaged threads. Remove the drill guide and clean out the chips with an air blast.

Step 3. Tap guide (B) is placed over the shank of tap (C) and then positioned in the head as shown in Fig 6, right. When the insert threads are cut, the tap and guide are removed and the hole again cleared of chips.

Step 4. The proper prewinder (F of Fig. 5) is placed in the counterbored section of sleeve assembly (E). The hole in the prewinder must be aligned with the pin on the leaf spring and its smaller diameter must be outside the body. Nib (G) for the insert being installed is attached to a ½-in socket wrench extension.

Step 5. Thread insert (D) is placed on the nib so that its inserting tang will engage the slot in the nib and faces the mouth of the slot. The drive wrench is held upright so that the insert will stay on the nib (see Fig. 7, left). Nib and insert are slid into body (E) until insert rests against the prewinder. The drive wrench is turned clockwise with slight forward pressure until the insert is wound into the prewinder three or four turns.

Step 6. Prewinder assembly is now pressed downward firmly against the work and the insert turned into the hole until turning resistance disappears. This shows that the insert is positioned properly ¼-to ½-turn below the surface of the casting (Fig. 8) Finally, the inserting tang is broken off.

General

The inserting tool and guides just described were specially designed for making a perfectly-aligned repair at the bottom of a recess. The principle employed, however, is no different from that of ordinary repairs where standard tools may be used. The two examples serve to illustrate the broad application of the wire inserts.

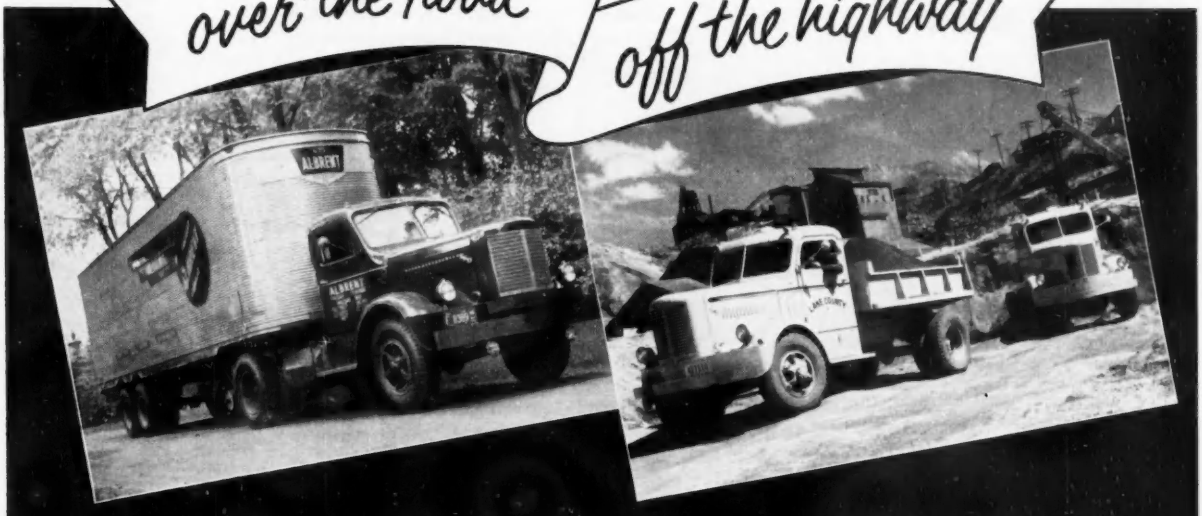
Free-diameters of the Heli-Coil inserts are slightly larger than the holes in which they are inserted. During insertion this free-diameter is reduced to slightly less than that of the receiving hole. When in place and released, the insert expands into the receiving thread with spring-like action and locks into place. Vibration or turning action will not dislodge it. However, if desired, it can be removed by hand using another tool.

The thread inserts are made of 18-8 stainless steel. This is another reason why the threads formed are stronger and more durable than the original ones. A further advantage is that the characteristics of this metal are valuable in resisting high temperature corrosion, seizing and wear.

WAUKESHA

THE PAYLOAD POWER PLANT-

over the road *off the highway*



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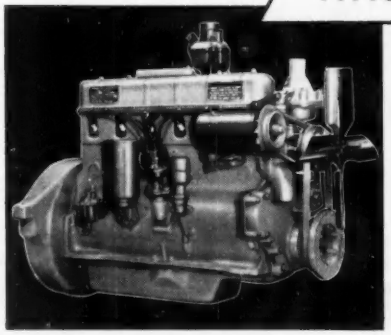
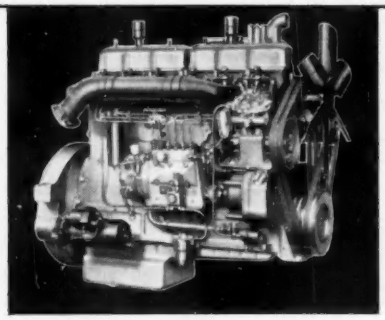
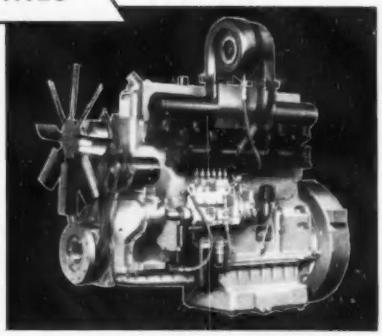


195-GKA—GASOLINE—6-cyl., 4⅛-in. x 4-in., 320 cu. in. displacement, Maximum hp. 122 @ 3000 rpm.



148-DKB—NORMAL DIESEL—6-cyl., 5¼-in. x 6-in., 779 cu. in. displacement, Maximum hp. 200 @ 2100 rpm.



WAKDBS—TURBOCHARGED DIESEL—6-cyl., 6¼-in. x 6½-in., 1197 cu. in. displacement, Maximum hp. 352 @ 1800 rpm.

For Details on the Complete Waukesha Line—Get Bulletin 1079

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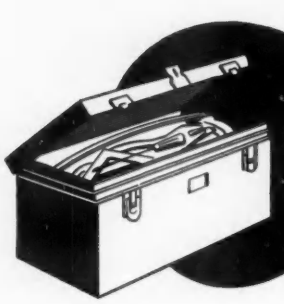


Straight from the Tool Box

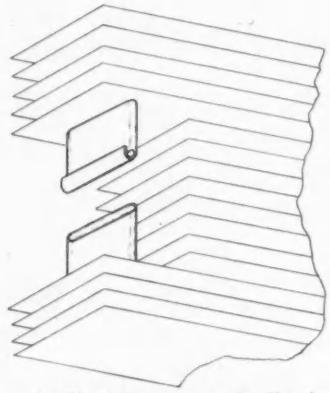
This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Soldering Radiator Tubes

JACK VINCENTI, BURGETTSTOWN, PA.—Sooner or later every mechanic is called out in the field or on the road to repair a leaking radiator core. Sometimes tubes break from working of the core but more frequently, something hard gets pushed through the radiator and punctures them. You can pinch the tubes but soldering makes a better repair.

The first step is to cut out some of the finning around the broken tube so that you can get at it. Cut out only enough to let you work. Next, I cut out a little of the tube to make room to use a small flame. The ends are very thoroughly cleaned with acid so as to get a good bond. Now, we come to soldering.

It is pretty tricky trying to sweat the top part of the tube. I have found a simple method that makes it a cinch. When I cut the tube, it's at an angle. I also cut away part of the upper tube so as to leave a ½-in flap on one side. This flap is bent up to form a channel to hold the solder. When you do this, there is nothing to it.



Cut the tube at an angle. Flap is formed and bent as shown to hold solder when sweating top tube.

Sounds like a good idea. Having just finished a sweated copper piping job, we would like to emphasize the cleaning angle. The one joint we skimped on cleaning was the only one that leaked. Time spent in unsweating and recleaning was all out of proportion to that required to do the job right the first time. Also, don't go around indiscriminately blocking tubes. You don't have to block many before you are up against it for cooling capacity—Editor.

Holding Cat Starting Motors Tight

RICHARD PROENNEKE, DONNELLSON, IOWA—My experience has to do with dirt-moving equipment. We have eight R Series Cat D-8's and one D-7. One of our problems has been to keep gaskets between the starting motor and the diesel engine block. No matter how carefully the job was done, it seldom lasted more than two or three months. Many of the tapped holes were worn or chipped from operating with a loose starting motor.

I finally suggested a solid copper gasket. I made one from copper that was about as thick as the stock gasket. This was annealed and given a coating of No. 2 Permatex on both sides. Cat's stock capscrews with shake-proof washers were used and the assembly cinched with a 3/8-in drive flex.

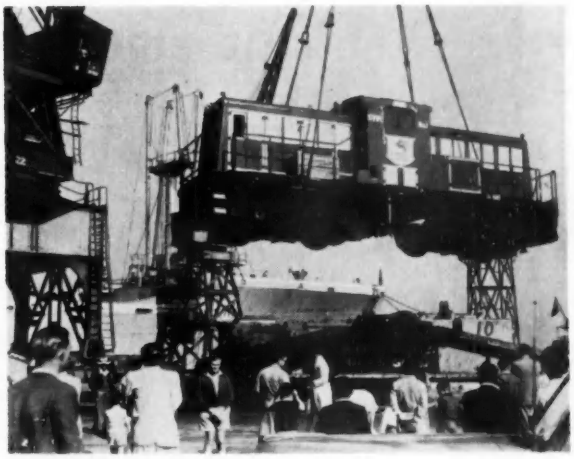
This was done eight months ago on six D-8's and the D-7. So far, the copper gaskets have worked out without any trouble at all.

There is no doubt that the copper gasket will stand more chafing than a fiber gasket or that the Permatex will help stop relative motion. I wonder, though, if perhaps the shake-proof washers aren't the principal reason for the success of the idea. It is very hard to keep fastenings tight when a lot of shaking force is envolved and particularly so when holding threads are worn or broken. Keeping the capscrews tight strikes me as being the most important job. You'll be interested in the article on Page 46 as I think that this type of repair will get at the root of the trouble.—Editor

news of our industry

Built to Move Mountains

Helping West Virginia to conquer its savage hills with a modern 88-mi turnpike from Charleston to Princeton, is an army of men and machines. Some of the biggest equipment on the project is used by the Latrobe Road Construction Company of Latrobe, Pennsylvania. In the illustration, Latrobe's 5½-yd Manitowoc 4500, the largest shovel on the turnpike, is shown ready to load a 22-ton Euclid rear dumper. The Manitowoc is powered by a 550-hp Model NVHS-1200 Cummins diesel-torque converter package. The Euclids shown in the photo are powered by 300-hp Model NHRBS-600 Cummins engines.



B-L-H—Westinghouse Unit for South Africa

Within recent years, Baldwin has delivered 93 diesel-electric locomotives to French North Africa, 64 of which were put to work in Algiers, 25 more in Morocco and four in Tunisia. Nine of the 25 shipped to Morocco were fitted with special sand-proofing equipment for desert operation.

Among the latest shipments by Baldwin to off-shore points was this 65-ton industrial diesel-electric locomotive. It is shown while being unloaded from the SS Robin Doncaster at Durban, South Africa.

Built by the Baldwin-Lima-Hamilton Corporation of Philadelphia for the Standard Vacuum Oil Company, the 400-hp switching unit's initial job is to help the Foster Wheeler Corporation construct Standard Vacuum's new refinery at Durban.

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new literature . . . . . page 58

organizational news . . . . . page 60

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news of our industry

Use Propane in Large Diesels

Successful completion of tests in burning propane in Worthington 4-cycle supercharged dual-fuel diesel engines was recently reported at a meeting of the Iowa Assn. of Municipal Utilities by Glen V. Yarger, superintendent of the muncipal utilities at Waverly, Iowa. This is the first announced successful application of commercial propane fuel use in large diesels (1245 kw and 1350 kw) at diesel compression ratio, with a minimum pilot oil consumption of approximately five per cent. Mr. Yarger made the announcement during a panel discussion on modern diesel developments.

After two years of development work, successful operation on propane was begun at Waverly at the end of January. Fuel consumption was reported better than guarantees made for the same engines operating on natural gas with a minimum consumption of pilot oil. Less than 9000 Btu/kw hr is being used at full load.

With the improved economy, Mr. Yarger stated that he is saving 20 per cent on fuel costs. Diesel fuel at Waverly is delivered for 11 cents a gallon. Propane, cost of which varies throughout the year, now costs 6½ cents per gallon. Although the oil has 1½ times the Btu content of the propane, the lower cost of the propane has the advantage.

Railway Diesel Fuel Buys Grow

Expenditures made by Class I railroads in 1953 for fuel, materials, and supplies (excluding equipment) totaled $1,920,481,000, according to an announcement by the Assn. of American Railroads. This was an increase of $102,731,000 above expenditures in 1952.

For fuel alone, the railroads spent $509,611,000 in 1953 compared with $538,659,000 in 1952. Expenditures for bituminous and anthracite coal dropped by $46,972,000 compared with figures for 1952. This compares with an increase in expenditures for diesel fuel oil totaling $300,219,000, a rise of $38,423,000 above the previous year.

news of our industry

Municipal Doubles Capacity

Purchase of a new diesel power unit which will double present power capacity of the five units in its plant has been announced by the village of Bethel, Ohio. It has placed an order for a 1765-hp Superior diesel with The National Supply Co.

The new unit is expected to be in service before the end of the year. It is a Model 65 supercharged, 4-cycle, 8-cyl engine with 12¾-in bore and 15-in stroke, with a running speed of 600 rpm, and will drive an Elliott generator of 1250-kw capacity.

The original two diesel power units, installed in 1928 and having a combined output of 185 kw, will be removed to make room for the new unit, and a new foundation will be built. This will leave the plant three units totaling 1050-kw capacity, to be increased to 2300 kw with the new unit. Of the plant's four diesel units, two Superior engines will comprise three-fourths of total capacity.

Oil and Gas Power Conference

Featuring a technical program of interest to pipeliners, power plant operators and all concerned with diesel, dual-fuel and gas engines, the Oil and Gas Power Div. of the American Society of Mechanical Engineers is scheduling its 26th Annual Conference and Exhibit for the Muehlebach Hotel in Kansas City, June 14 to 17.

Program highlights consist of technical papers on cooling system problems, cooling equipment, foundations for pipeline compressors, engine analyzers, turbocharging of 2-cycle engines, gas transmission compressor cylinder design trends, and pipeline construction. Also scheduled is a technical session, co-sponsored by the Gas Turbine Div., on gas turbines in pipeline pumping.

Said to be of special interest is a planned discussion of the proposed speed governing specifications for engine-generator units as recommended by a joint AIEE-ASME committee. The program of technical meetings will be interspersed with exhibit inspection periods.

At the new Bradley Field airport in Connecticut, reliable emergency power is vital . . . the right battery for starting the emergency Diesel equally vital. This installation uses Nicad. System operates field lights, control tower, INSAC station, instrument landing system.

Airport Emergency Lighting

. . . that's a starting job for NICAD

The 375 h.p. Diesel emergency lighting system which protects this airport is started by a Nicad battery.

Field lights and control tower would stay in darkness were the battery to fail in its job. But the Nicad's characteristics are positive . . . custom-groomed to the service. Like its European ancestors, this nickel cadmium battery is protected against self-deterioration and outside damage. Its cells are steel, inside and out, its alkaline electrolyte a preservative of steel.

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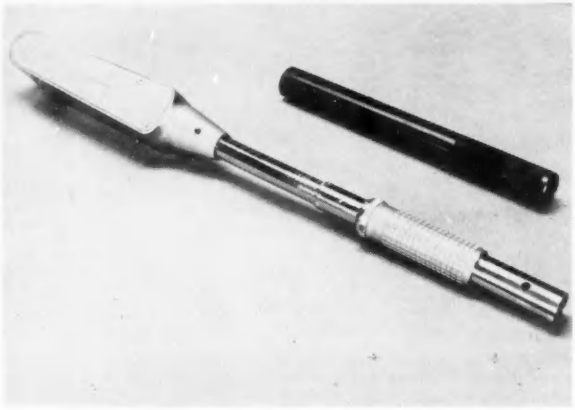
new products



Torque-Limiting Wrench

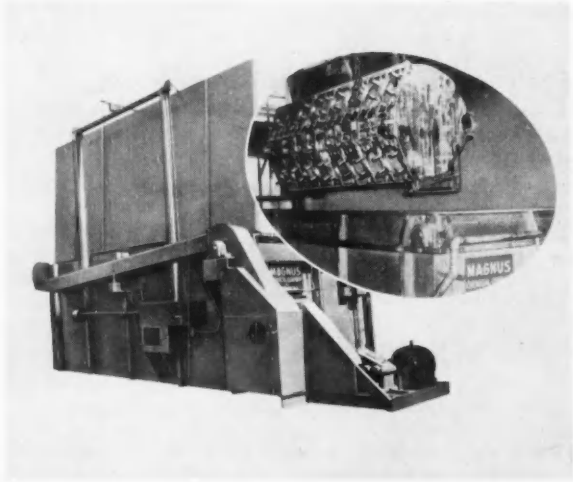
Jo-Line Tools, Inc., has introduced the Model JOMI 4800 torque-limiting wrench which extends its line of torque-limiting tools and accessories. Incorporating an automatic torque release mechanism the tool is designed to eliminate error. Torque settings are accomplished in a manner similar to that used on a micrometer. When the torque setting is reached, the wrench automatically releases, hence the operator is not dependent upon audible or visual signals. Range is from 100 to 400 ft-lb. Detailed information is available from Jo-Line Tools, Inc., 8442 Otis Street, South Gate, California.

Portable Cabinet

Introduced by the General Industrial Company, this handy cabinet has been designed to fill the needs of servicemen and repairmen who require an assortment of small parts or tools at a job site.

This model, the JC-32-SD has 24 transparent plastic drawers, each 1 7/16-in high by 2 3/4-in wide by 5 7/8-in deep and one large steel drawer, 3 1/8-in high by 11½-in wide by 5 7/8-in deep. Dividers for the plastic drawers provide 72 adjustable compartments.

The non-slip handles and welded all-steel cabinets are said to be rigidly constructed and tested to carry a 100-lb load, safely. Front doors have padlock hasps and the steel backs of the cabinets have four keyholes for wall hanging. Detailed information available from the company at 5738 Elston Avenue, Chicago, Illinois.



Washing Machine

A 10,000 lb capacity, mechanically-agitated washing machine has been added to the line of Aja Dip diesel parts cleaning equipment produced by the Magnus Chemical Company, Inc. This new mammoth machine is designed to automatically clean a complete diesel block.

Operation of the Aja Dip machine is based on two principles: complete immersion of the work in the solution; and vigorous up and down mechanical agitation of the work in the solution, at the rate of 54 times per minute. This up and down travel is said to force the detergent against all exterior and interior surfaces, even into the deepest recesses.

For complete detailed information, write to the Equipment Division of the Magnus Chemical Company, Department M, Garwood, New Jersey.

new products

Single Hexagon Wrenches

A new series of four combination open-end "boxocket" wrenches with single hexagon openings on the box socket end has been announced by Snap-on Tools Corp., Kenosha, Wis. The single hex openings are to provide extra gripping power for slightly undersized or chewed-up nuts and on Parker-Kalon self-tapping screws with rounded corners. They are also claimed to prevent damage of brass or other soft metal fasteners and fittings because of a greater contact area provided by the six-sided shape.

The wrenches are made in 5/16-in, 3/8-in, 7/16-in, and 1/2-in sizes, both open end and box socket opening the same size on each wrench. Overall lengths are comparatively short, 5 in to 5 3/4 in, for close work in restricted areas. The tools are finished in polished chrome.

Lapping and Polishing Stone

Available through Abrasive Engineers, 245 Waukegan Ave., Highwood, Ill., is a fixed abrasive lapping and polishing stone which may be used for parts after surface-grinding or fine-machine finishing. Hardened steels as well as soft metals, alloys, and carbons may be used for attaining 2 micro-in finish, with no skill said to be required. The stone comes in various sizes and is claimed capable of easily reconditioning by the user.

Motor Rotation & Phase Tester

A device for determining the direction of rotation of electric motors before they are connected to the line and also the phase rotation or sequence of energized power circuits is being produced by James G. Biddle Co., 1316 Arch St., Philadelphia 7, Pa. In addition, the instrument can determine the polarity of power and instrument transformers and can be used as a continuity tester in checking electrical circuits.

The unit weighs 10 lb and is supplied complete with three line and three motor leads which store in compartments on either side of the instrument panel.

NIFE

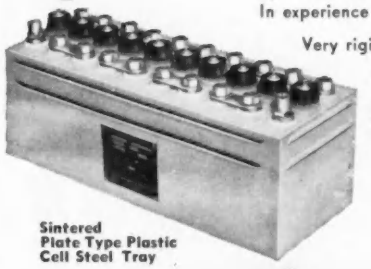
The Original
NICKEL CADMIUM
BATTERY

THERE IS A DIFFERENCE

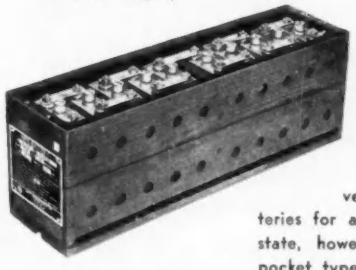
NIFE Nickel Cadmium Batteries have been considered the standard around the world for almost 50 years. Other nickel cadmium battery companies, imitating us, refer with pride to our performance in Europe and all over the world as their own. Only the NIFE Nickel Cadmium Battery is the subject of the original patents granted in the United States to Waldemar Jungner, exclusively, in 1901 and 1903 and is made in the U. S.A. by NIFE INCORPORATED. NIFE batteries do not fail or lose capacity in many years of service.

Other nickel cadmium batteries of recent adoption (since World War II) have been confused with ours by their embodying the principles of the NIFE BATTERY. In experience and know-how, THERE IS A DIFFERENCE.

Very rigid tests were conducted by a leading diesel engine manufacturer whose big engine, using NIFE BATTERIES, was started 170 times without a recharge. Other imitation batteries have failed in this service.



Sintered Plate Type Plastic Cell Steel Tray



Pocket Type All Steel Construction Hardwood Tray

Our company started producing the NIFE battery type SIPO—with sintered plates—since World War II. We recommend their use where high discharge currents at low temperatures are a factor. Claims made as to the life expectancy of alkaline batteries with sintered plates are not yet verified as no manufacturer has had their batteries for any length of time in actual use. We can state, however, that NIFE batteries of the ordinary pocket type are known to have been in use for diesel starting purposes over 20 years. We will be glad, however, to deliver sintered plate or pocket plate type batteries for every use in any size and quantity desired.

NIFE INCORPORATED
COPIAGUE, L. I. • NEW YORK, U.S.A.
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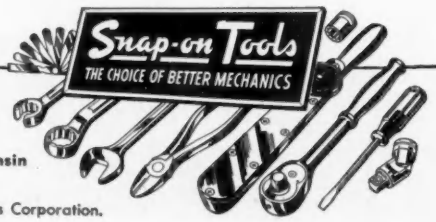
RIGHT TOOL
in the right place at the right time!

No. 5166-GS-B

Snap-on* MECHANICS STANDARD SERVICE SET

● No time lost hunting *the right tool* when this carefully planned Snap-on set is at hand. No time-wasting "make-do" with sloppy misfit tools! Each of the 166 tools in the set is a basic in handling operations most frequently encountered in all types of maintenance work. In orderly arrangement in the big six-drawer chest, they are *safe,* and right at the finger tips when needed. Available through your nearby Snap-on factory branch. For free 104-page catalog of 4000 Snap-on hand and bench tools, write



SNAP-ON TOOLS CORPORATION
8064-E 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

new products

Meter for Washing Compound

A new control instrument to show that the right amount of metal washing compound is being used in a washing operation has been announced by The Du Bois Co., Inc., 1120-1140 W. Front St., Cincinnati 3, Ohio. Called Econometer, the instrument is ready for work upon being plugged into any light socket.

Self-Locking Threaded Inserts

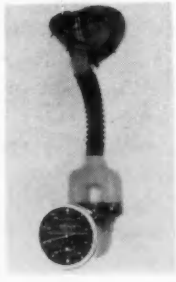
The Nylok Corp., Elmira Heights, N.Y., has placed on the market self-locking threaded inserts for use in non-ferrous forgings, castings and extrusions, said to eliminate counterboring, special tapping, and to require no special tools for insertion or removal.

The inserts are claimed to eliminate thread failure in castings by absorbing stresses and to prevent thread wear and stripping. Use of standard screw driver simplifies maintenance in the field. The inserts may be used many times without impairing the locking feature.

Gas Volume Meter

A small, pocket-size gas volume meter that will continuously indicate the volume readings of any gas passed through it has been introduced by J. J. Monaghan Co., Inc., 500 Alcott St., Denver, Col.

The principle of the instrument is one of positive displacement. As gas is introduced, a set of rotors turn, which movement is carried up through timing gears and a gear train to the calibrated dial which indicates cu cm in the large circle and liters in the small. Accuracy is said to be within 5 per cent between the range of 5 to 68 liters flow rate per minute.



new products

Removal of Gasket Cements

A new use for "Stripit", paint and enamel remover, has been announced by Magnus Chemical Co., Inc., Garwood, N.J. Form-a-gasket and other cements from diesel engine parts may now be removed, the manufacturer reveals. The application is said to have been first tried by a Midwest railroad.

These cements are adhesive and resistant to ordinary paint removers. Removal involved hand scraping, even after application of solvents and similar materials. With the product, it is claimed, all that is necessary is for the surface of the cement to be well brushed with the solution. After it has soaked in for a short time, the deposit is then said to be quickly and easily removed with a putty knife or scraper, right down to the metal.

Tubing Joint for Exhausts

A quick-assembly joint for 1-in to 5-in OD tubing is available from Marman Products Co., Inc., 940 W. Florence Ave., Inglewood, Cal. Offered in either stainless or cold-rolled steel, it is designed for coupling exhaust manifolds and exhaust piping joints operating at normal internal combustion engine temperatures and low internal static pressures and for other applications with similar requirements.

The new joint is designated J-61 in stainless steel and J-62 in cold-rolled steel.

Teflon Pipe Thread Compound

Flexrock Co., 3603-P-Filbert St., Philadelphia 1, Pa., has developed a thread sealing compound designated Flexrock 25, Teflon pipe dope. It is recommended for use on chrome, chrome plate, nickel steel, ceramic and plastic pipe threads, and for joining or connecting dissimilar materials.

Lubricating qualities of the compound are said to prevent galled threads and permit easier pipe joining as well as ready dismantling after long periods of exposure. Good sealing is also said to be achieved without application of maximum torque.

with **NUGENT**

LUBE OIL FILTERS

THE motor vessel Gaetano S. has had her troubles with lube oil filtering. But they all ended on November 1, 1952.

On that day a Nugent #4L strainer (FIG. 1554) was installed for full flow filtering of lube oil for the vessel's 8 cylinder, 350 H. P. Cooper-Bessemer diesel. A Nugent #4L disc type filter (FIG. 1555) and a #4S type were installed for by-pass.

By February 3, 1953, the vessel had logged 1250 hours of engine operation. At this time the filters were checked. The dirty recharge from the #4S weighed 18 lbs. 7 ozs. after draining. When new it weighs 6 lbs. The #4L weighed 30 lbs. When new it weighs 10½ lbs. A total of 21 lbs. of dirt and carbon were prevented from reaching vital engine parts in five months time.

Th's is the type of protection that any diesel needs—on land or on sea. Write for complete information on a Nugent filtering system to meet your needs.

NUGENT TRADE MARK

Wm. W. Nugent & Co., Inc.

417 N. Hermitage Ave. CHICAGO 22, ILLINOIS

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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new literature

Film on Lubricant Handling

"No Margin for Error" is the title of a new sound slide film, containing answers to lubrication problems, that has just been released by Alemite, a division of Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14, Ill.

The 35-mm film lasts 15 min and takes the audience into a typical industrial plant to illustrate the right and wrong way of handling lubricants from barrel to bearing. Five plans on lubricant handling are presented. They range from the simplest hand guns and loader pumps, through bucket and transfer pumps, portable power guns and transfer pumps, power-operated barrel pumps, to a complete lubrication department on wheels.

A 12-page booklet, "Five Plans for Better Plant Lubrication", emphasizes the plans in the film and in addition points out seven ways to cut production costs. Machine downtime, machine repair and service, less waste of lubricant, less manhours, product spoilage elimination, cheaper housekeeping, and safety hazard elimination are discussed.

Automatic Transfer Switches

Designed as a guide for those responsible for selecting automatic transfer switches and for installing, hooking up, and maintaining emergency lighting and power sources is a new publication released by the Automatic Switch Co., Orange, N. J.

Factors to look for in selecting switches are described, including continuous duty rating, single vs. double throw, quiet operation, space requirements, and full relay protection. The pamphlet is written in concise language and contains necessary wiring diagrams and photographs.

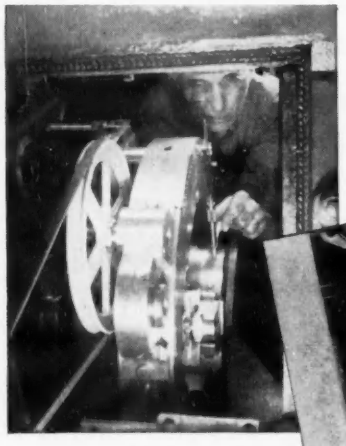
Properties of "S" Monel

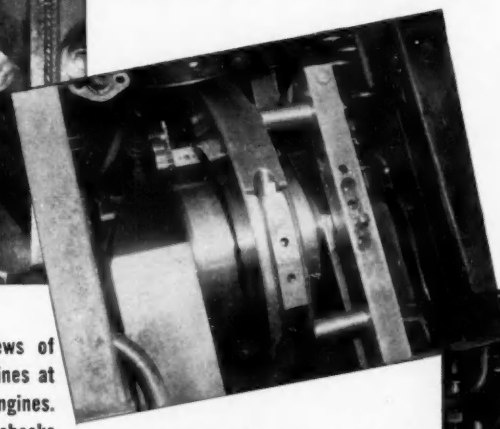
A technical booklet on the engineering properties of "S" Monel has been issued by The International Nickel Co., Inc., Development and Research Div., 67 Wall St., New York 5, N.Y.

"S" Monal is an age-hardenable casting alloy said to provide high strength, hardness and anti-galling properties at temperatures up to 1100°F., in addition to the general corrosion resistance of Monel. Principal difference between it and wrought Monel is the silicon content of about four per cent which produces the precipitation hardening characteristics.

Metallic O-Rings

A 20-page, 2-color booklet, "Self-Energized Metallic O-Rings", has been issued by United Aircraft Products, Inc., Box 1035, Dayton 1, Ohio. The booklet deals with vented and standard O-rings and the various industrial applications for static sealing of high and low pressures and temperatures.

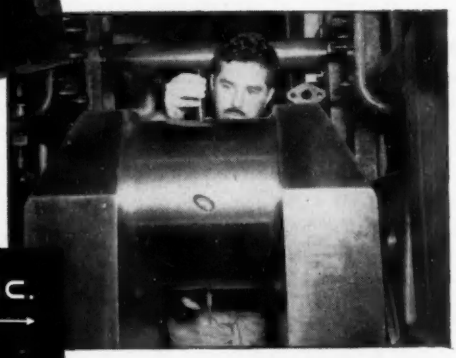




CRANK PINS REFINISHED IN PLACE

For engines of practically any size our Portable Machines are available for quick and economical restoration of damaged crank pins. Let us help you minimize down-time.

Requests for the purchase of these machines have become so numerous we have decided to manufacture them for sale and invite your inquiries.



Above illustrations show views of our Portable Crank Pin Machines at work in various size marine engines. At right a marine engineer checks the accuracy of a refinished crank journal.

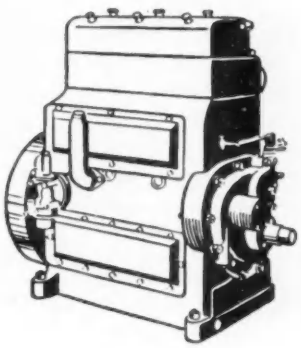
Additional information furnished without obligation

WASHINGTON IRON WORKS, INC.
Established 1876
SHERMAN, TEXAS

BUKH Diesel

Built in one, two or three cylinder units, BUKH engines are conservatively rated from 6 to 30 bhp for continuous duty. Equipped with either unique patented cartridge starter, manual or electric starter, efficient mechanical governor and dependable Bosch fuel system, the BUKH assures you of instant, reliable, low-cost power.

There is a BUKH 4-cycle full diesel tailored to suit your requirements for marine or land, stationary or mobile power. Fifty years of diesel experience is behind their outstanding dependability and economy.



BURMEISTER & WAIN AMERICAN CORPORATION

Write for details

BURMEISTER & WAIN AMERICAN CORPORATION

17 Battery Place, New York 4, N. Y.

new literature

Oilfield & Pipeline Equipment

A new bulletin detailing its line of equipment for oilfield and pipeline is offered by Worthington Corp., Harrison, N. J.

The bulletin, graphically illustrated with application photographs, contains specification information on various types of pumps, turbines, compressors, air tools, and power transmission equipment. Included information details the 4-cycle diesel, gas, and dual-fuel engines for this application.

Metalworking Tools

A condensed specifications folder cataloging all its principal tools designed for the metalworking industry has been issued by the Delta Power Tool Div. of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.

Advantages of the power tools over machine tools are discussed. Photographs illustrate the various tools in standing form and in application shots.

Guide on Hazardous Gases

Acme Protection Equipment Co., 3037 W. Lake St., Chicago 12, Ill., has published a comprehensive list of hazardous gases, the tabulation containing a total of 433 gases, fumes, mists and dusts present in operations where a gas mask should be worn. Included is descriptive information, limits for determining safe working conditions, and type of Acme canister designed for each hazard.

Cooling Tower Water Treatment

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., has released a bulletin on the subject of water treatment for cooling towers.

Types of cooling systems are discussed together with such problems as corrosion of metal surfaces, inorganic scaling, organic growths, and delignification of the wood in the tower. Information on selection of chemical treatment is included, along with a table showing type and amount of treatment effective for scale- or corrosion - prevention under various operating conditions.

Vertical Muffle Furnaces

Surface Combustion Corp., Toledo 1, Ohio describes its vertical-type "Atmotrol" muffle furnaces in Bulletin SC-165, just issued.

The bulletin includes a detail construction drawing depicting important design features, photographs of typical applications with types of parts being heat-treated, and details of accompanying equipment — controlled cooling pits and prepared atmosphere generators. Engineering data and charts on the application of RX atmospheres to heat-treat processing are also included.

High Speed Flow Control

Bulletin 470 has just been issued by The Foxboro Co., Foxboro, Mass., introducing its Model 59 valve-mounted controller for high speed flow control applications. The 8-page bulletin covers a typical system, dividing it into its four components: controller, set point transmitter, measurement transmitter, and control valve. Complete specifications are included.

organizational news

P&H Establishes New Division

To handle sales of P&H electrical equipment, Harnischfeger Corp. has established the new P&H Electrical Sales Div. Oliver Fuller, formerly of P&H Welder and Excavator Mfg., has been named its head. Products to be handled by the division include AC and DC motors, motor generator sets, bare generators, magnetic and hydraulic brakes, controllers, and limit switches.

Worthington Into Colombia

Worthington Corp. announces establishment of a new subsidiary, Worthington Limitada, in Bogota, Colombia. It will be managed by Charles Gorham who joined the corporation in 1939 as an engineer and has been in Colombia for five years.

L. B. Neumiller

H. S. Eberhard

Caterpillar Elections

Louis B. Neumiller, who has been president of the Caterpillar Tractor Co. for the past 12 years, has been elected chairman of the board of directors. Harmon S. Eberhard has been chosen president to succeed him.

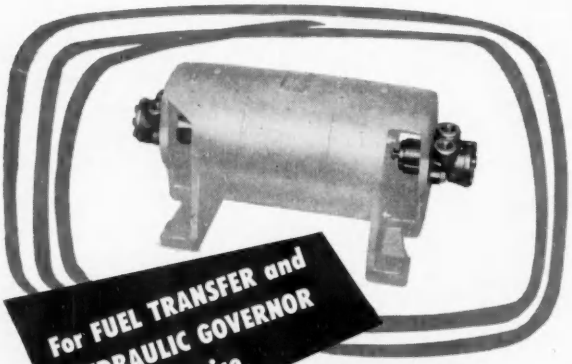
The election of Mr. Neumiller comes as the culmination of a lifelong career with the company. He entered as a stenographer-clerk in 1915. In 1941, at the age of 45, and after experience in many departments, he was elected president.

Mr. Eberhard began his career as draftsman at Caterpillar in 1900. After various engineering assignments, he was named chief engineer in 1933, vice president in charge of engineering, manufacturing, and research in 1942, and executive vice president in 1950.

Brad Foote Vice President

Carl E. Overton has been elected vice president in charge of sales for Brad Foote Gear Works, Inc.

Mr. Overton joined the organization in 1948 as a sales engineer. He was made works manager in 1949 and became sales manager in 1950.



For FUEL TRANSFER and HYDRAULIC GOVERNOR Service

TUTHILL

MODEL L PUMPS ARE PERFORMANCE-PROVED

Throughout the diesel industry, Tuthill Model L pumps are recognized for their dependability in fuel transfer and hydraulic governor service. Model L is a mechanically-sealed, positive displacement internal-gear rotary pump, assuring quiet, leak-free operation with low power consumption. Capacities from .33 to 6 g.p.m. in wide pressure ranges. Available as single or double-pump units. Write for Catalog No. 101 including Pump Guide for diesel applications.

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Dependable Rotary Pumps since 1927
939 East 95th Street, Chicago 19, Ill.

Canadian Affiliate: Ingersoll Machine & Tool Company, Ltd., Ingersoll, Ontario, Canada

This...INDICATOR VALVE is Guaranteed to Stay Tight!

BACHARAH MODEL YYL

5 YEAR SERVICE BOND
Free Factory Service if leakage develops within 5 years from registration date designated by the Reg. No. stamped on the valve.

Fully opened or closed by one quick turn of handwheel.

Dependable, tight closing by hand pressure under all conditions.

Relief passage for venting of indicator is opened and closed automatically when turning handwheel.

Valve never needs to be removed from engine for replacement of any parts.

Valve spindle not exposed to direct flame of combustion; therefore, no galling of threads nor sticking of spindle in gland.

Exceptional durability and trouble-free performance has been achieved by new concept of design—the use of a free-moving ball as the seating element. Ball is seated gas-tight by force of engine pressure when valve is closed, and forced off its seat by valve spindle to open valve.

WRITE FOR BULLETIN 654D

BACHARACH INDUSTRIAL INSTRUMENT CO.
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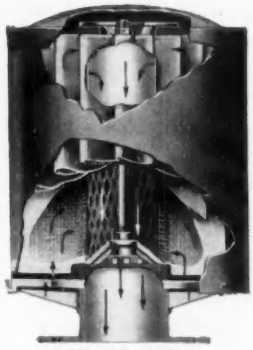
STAYNEW
INTAKE FILTERS
HELP YOUR EQUIPMENT STAY NEW!


MODEL D Intake Filter

STAYNEW'S
Positive Protection
Features

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- Model DS Silencer Filters Are Available Where Noise Is a Problem.
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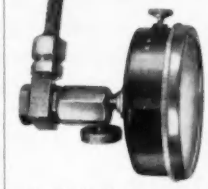
PEAK PRESSURE INDICATOR



For Testing Firing and Compression Pressures on all Models of Diesel and Gas Engines. Dependable — Rugged. May be Used With or Without Flexible Tube.

MODEL K-120 Indicator has but one moving-part — nothing to wear or get out of adjustment.

VALVE — Gas trap type with diaphragm type check valve having adjustable lift. Stainless steel valve and seat.

No springs — No pistons — no complicated adjustments — No temperature corrections — no pressure loss in check valve.

GAGE READS TRUE PRESSURE — MAY BE RECALIBRATED ON ANY GAGE TESTER

Check readings can be made over and over again by releasing indicated pressures with bleeder valve.

ADAPTORS available for most models of engines manufactured in U. S. A. Other models made to order at reasonable prices.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

organizational news

Nickles Machine Expands

A major expansion has recently tripled the floor space of the Nickles Machine Corp. in Ponca City, Okla., and work has been started to add 4000 sq ft more to the expansion.

The company, founded in 1930 by C. A. Nickles, has expanded steadily as a manufacturer of replacement parts and repair service on stationary diesels, gas engine compressors and pumping equipment. A considerable part of its work has recently been done for South American installations.

Vibration Consultants Expand

The firm of Noonan, Knopfle & Feldman, specialists in vibration and acoustics, has opened offices in Washington and New York. The organization offers services for mathematical analysis and measurement of torsional vibration characteristics in diesel generator sets, diesel-driven pumps and compressors, and the like.

LeTourneau Export Appointees

To introduce new equipment in world-wide market areas R. G. LeTourneau, Inc., has appointed Felix G. Evangelist as export administrator and Jack Adams as a special foreign sales representative.

The company is introducing several new lines of heavy-duty electrically powered and controlled equipment to the fields of heavy transport, land clearing, and materials handling. Electric power for all the motors is furnished by a diesel-electric generating set mounted on the equipment.

Mr. Evangelist has been engaged in the export of heavy equipment and machinery for the past eight years. He has headed his own export firm on the East Coast. Mr. Adams will make distributorship arrangements in Africa and the Middle East. He has spent many years in that part of the world as an independent broker in heavy construction and transportation equipment.

F. Evangelist

J. Adams

Allis-Chalmers Vice President

William J. Klein has been named vice president and general sales manager of the Tractor Div. of Allis-Chalmers Mfg. Co.

Mr. Klein started his career with the company in 1928 as a salesman at the Sioux Falls branch and shortly thereafter became a blockman in South Dakota. In 1929, he was made a special factory representative and in 1930 he opened the company's Minneapolis branch.

Mathematical Group Enlarges

Mathematical Computing Service, consultants in applied mathematics, announces that it has organized a group to deal with applied mathematics in the field of automotive engineering.

news of our industry

DEMA Educational Meetings

The Diesel Engine Manufacturers Assn. has scheduled eight educational meetings for the balance of the year. The first of these will be held at Purdue University, Lafayette, Ind., for college representatives, May 21 and 22. Discussions will include laboratory equipment and experiments, and text material covering internal combustion engines, thermodynamics, fuels and combustion, and machine design.

During the week of June 14, which covers the annual meeting of the Oil and Gas Power Div. of the American Society of Mechanical Engineers, at Kansas City, Mo., DEMA will sponsor a breakfast for college professors and power plant operators. Subject for discussion will be "Preventive Maintenance of Electrical Equipment in a Diesel Engine Power Plant."

July 19-21 will see the fifth annual conference for diesel power plant operators at Iowa State College, Ames, Iowa. On October 7, a one-day conference will be held at Whiting, Ind., at the research laboratories of the Standard Oil Co., and will cover subjects dealing with diesel engines from the viewpoint of the oil industry.

The third annual two-day conference for diesel power plant operators at the University of Nebraska will be held October 14 and 15 in Lincoln. Paulsboro, N. J. will have a one-day conference for professors at the laboratories of Socony-Vacuum Oil Co. on October 21. The plant of the Johnson Bronze Co. at New Castle, Pa. will furnish a one-day meeting place on November 16, and a one-day conference will be held November 18 at the Esso Laboratories in Elizabeth, N. J.

MIT Summer Engine Course

A special summer program in internal combustion engines, emphasizing the analytical approach to performance, development, and design problems, will be given at the Massachusetts Institute of Technology from June 15 through June 25. The course is primarily for engineers responsible for designing and developing improved models of diesel or Otto-cycle engines, and for teachers of these and related subjects.

Under the direction of Prof. C. Fayette Taylor, professor of automotive engineering at MIT, the two-week program includes four topics: engine capacity, engine efficiency, engine design, and laboratory techniques and instrumentation. Further information may be obtained from the university's Summer Session Office, Room 7-103, Cambridge 39, Mass.

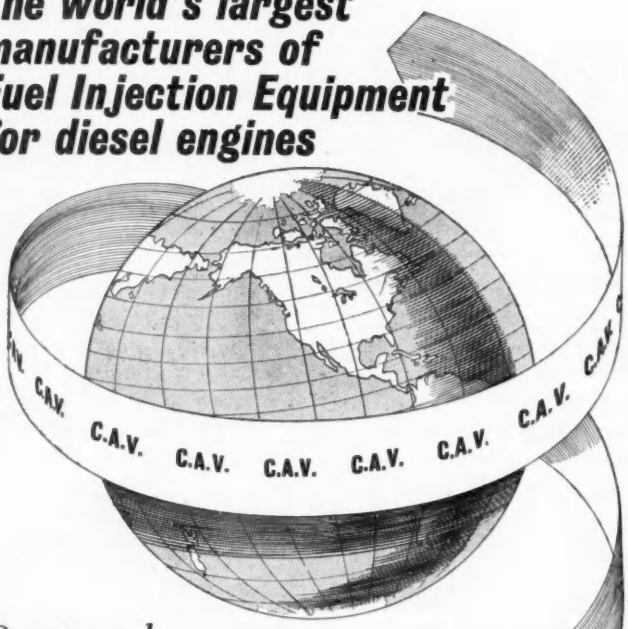
Permutit Opens New Plant

The latest addition in a series of expansion moves in a projected $1 million building program by the Permutit Co. was formally dedicated at Lancaster, Pa. The new metal working plant, costing approximately $750,000, follows the opening a few months ago of a new hydraulic laboratory and pilot plant at Birmingham, N. J.

The move into Lancaster was made to consolidate two similar operations and activities in Brooklyn, N. Y. and Philadelphia, Pa., it was stated.

C.A.V.

The world's largest manufacturers of Fuel Injection Equipment for diesel engines



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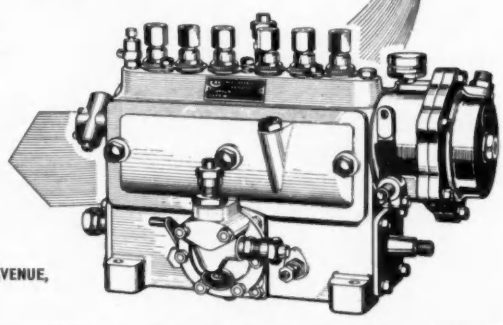

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Sales Office: 14820 DETROIT AVENUE, CLEVELAND 7, OHIO.

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174-606

new products

Gear Analyzer

Gear analysis is said to be accomplished visually by optical gauging methods with a new analyzer developed by Optical Gaging Products, Inc., 26 Forbes St., Rochester 11, N. Y. Direct observation of a magnified gear image allows inspection, analysis, and gauging of the gear under simulated operating conditions. Need for interpolative data is thereby eliminated.

The analyzer works on the following principles. The gear is viewed as it rotates in contact with, and at the correct center distance from, a composite rack. Analysis of the gear is made by observing the running action at a magnified projection on a Model 3 Kodak contour projector. A wide range of gear sizes are said to be capable of being checked, with no master gear required.

Small Parts Cleaner

Development of a small parts cleaner providing mechanical air agitation of solvents has been announced by Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Cal. The 6½-gal agitator unit is designed for attachment to any air hose. It has eight air jets which set up controlled turbulence to activate cleaning solvent, flushing parts as they are cleaned, and precipitating sludge to sump in bottom of the tank.

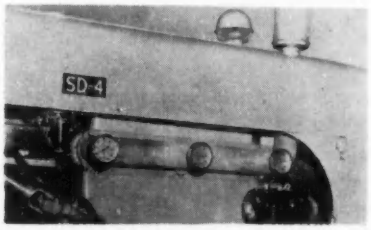
The parts cleaner is delivered with 5 gal of the company's solvent material, Jetisoil.

Fuel Injection System Testing

A method of checking fuel injection systems on diesel engines with Dillon bi-metallic dial-type thermometers has been announced by W. C. Dillon & Co., Inc., 14620 Keswick St., Van Nuys, Cal. This testing is currently being performed as part of standard factory and field service procedure at the R. H. Sheppard Co., Inc.

For the test, the thermometers are screwed into the exhaust manifold. If all thermometers register equally and if this temperature corresponds to factory standards, the fuel pump is correctly calibrated. If any one thermometer reads higher or lower than the others, it is an indication that the fuel injector feeding the cylinder to which the instrument is attached, is not adjusted correctly. In cases where one thermometer services a pair of cylinders and a reading shows that one of these cylinders is receiving too much or too little fuel, the unadjusted injector is determined by alternately cutting out one cylinder at a time.

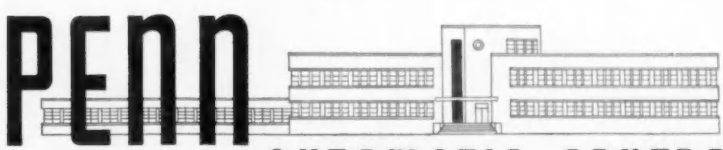
The particular thermometers used in this test are of the 200°F to 1000°F range with 5-in stems and 3-in dials. Apart from the standard factory test, a set of the thermometers is supplied to each Sheppard distributor as part of his field service kit.



THIS can happen to your engine
WATER TEMPERATURE TOO HIGH!
OIL PRESSURE FAILURE
...and so can this!
that's why your ENGINE NEEDS THIS...

PENN SAFETY CONTROL

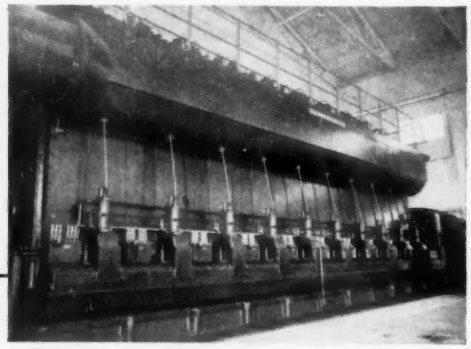
The first hint of overheated cooling water or lube oil pressure failure snaps the Penn Control into action. It will sound an alarm, flash a warning light, or stop engine operation . . . *whichever you choose.* Then, you can investigate and correct the minor trouble *before* serious damage occurs. Learn more about this *low-cost* protection. Write **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

WHY YOU SEE MANZEL SO OFTEN ON DIESEL ENGINES



Leading Diesel engine manufacturers *know* that buyers appreciate the trouble-free service given by Manzel protected equipment. They *know* that Manzel Force Feed Lubricators never forget or make mistakes . . . that they always supply every wearing point *exactly* the amount of oil it needs. As a result, moving parts function efficiently for many more years.

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new literature

Factors on Welding Elbows

Taylor Forge & Pipe Works, Inc., Chicago 90, Ill., is making available reprints of an ASME paper, "In-Plane Bending Properties of Welding Elbows."

Purpose of the paper is to provide design engineers with accurate, experimentally derived flexibility and stress intensification factors applicable to welding elbows commonly used in high pressure steam, oil refinery and gas compressor station piping systems. It is aimed at filling a gap in the practical design information available for this class of fitting.

Presented in the paper are results of strain gauge investigations conducted on relatively heavy wall "WeldELLs" having a ratio of bend radius to nominal pipe size of 1½:1, and several having a ratio of 1:1. A comparison is made of the results against theory. Design factors are established and tabulated.

Standby Installation

D. W. Onan & Sons Inc., Minneapolis 14, Minn., has issued a technical bulletin, T-011, covering the installation of emergency standby electric generating plants and automatic line transfer controls.

Intended for "the man who knows very little about the subject", the bulletin covers the technical material in simple language. Descriptions of generators, methods of control, and wiring diagrams are included. A diagrammatic drawing of a typical farm standby installation showing an electric meter as it is usually installed on the meter pole is also contained.

Engineering Service

A new brochure released by Barnes & Reinecke, Inc., 230 E. Ohio St., Chicago 11, Ill., outlines the scope of services offered by this engineering organization. Assignments engineered by the company range from design of household appliances to engineering and testing of diesel engines. The booklet explains the set-up of service groups for various client projects and lists work examples for each group.

organizational news

Nordberg Names Assistant

Appointment of George V. Dutney as special assistant to the president has been announced by Nordberg Mfg. Co. He will headquarter in New York.

Mr. Dutney was associated with Jones & Laughlin Steel Co. in various capacities until 1920, affiliating with Johns-Manville that year. In his new post, Mr. Dutney will be the special representative of the president in sales and special public relations throughout the country.

George V. Dutney

Hydrotor Distributor

The Rucker Co., Oakland, Cal., has been appointed distributor in the western states, British Columbia, Alaska and Hawaii for the Hydrotor, new hydraulic cranking system introduced by Hydromotive, Inc.

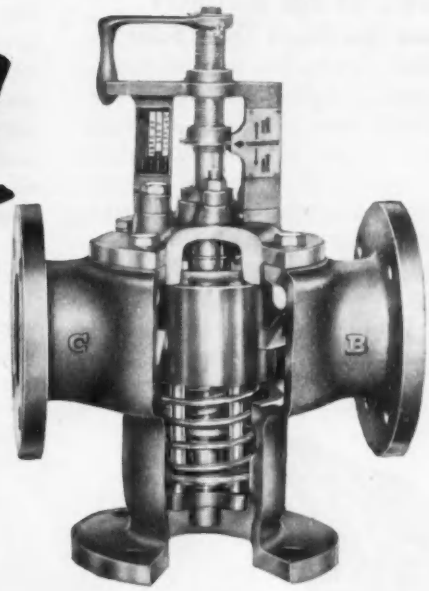
Alco Chief Chemist Dies

Arthur C. Mengel, chief chemical engineer of the American Locomotive Co., died suddenly of a heart attack at his home. He had been with the company since 1915 when he joined as assistant chief chemist.

Mr. Mengel became chief chemist in 1935, and by that time was a noted authority on locomotive lubricants. The company's postwar changeover from steam to diesel locomotive production brought about necessity for research into the new field. During this time, Mr. Mengel began testing procedures on locomotive lubricants and such industrial problems as corrosion prevention and development of new product cleaning methods. In his search for a more scientific method of analyzing lubricating oils, he was instrumental in Alco's purchase of a spectrograph and became an authority on its use.

NEW

SYLPHON ENGINE CONTROL for cooling water and lubricating oil



More efficient, economical engine protection

THE new Sylphon Engine Controls Nos. 1280 – 1281 are three-way valve regulators especially adapted to control temperatures of cooling water and lubricating oil on internal combustion engines with increased efficiency and less maintenance. Each stage in design was completed only after consultation with leading engine builders to assure that the most exacting engine control requirements would be met.

Stable temperature is assured by use of the newly-developed and proved pressure-insensitive, powerful, dependable fusion-type thermal elements. Control No. 1280 (pictured above) is provided with a quick-acting manual operator which may be used to override the thermal element to open and close the valve – No. 1281 does not have manual operator. Over-temperature protection standard for both regulators.

Compact, Self-contained, Self-powered. Controls operate automatically. No auxiliary source of power required.

Easily Serviced . . . Reduced Maintenance. Entire operating mechanism can be easily removed from the valve body without breaking pipe connections.

Operating Temperatures – Factory set for any specified operating temperature between 120° and 190° F.

Pressure Limit—Suitable for pressures up to 150 psig. Valve is completely balanced.

Sizes—2" to 6", inclusive.

Superior Construction and Finish. All valve bodies are bronze with flanged ends (150 lb. MSS or 100 lb. Navy). Springs are monel. Other parts are of brass and cadmium plated steel. Sturdily built to serve for years.

For more information about these new Sylphon Controls, write today for Catalog JD-817.

Robertshaw-Fulton CONTROLS COMPANY

FULTON SYLPHON DIVISION • KNOXVILLE 1, TENN.

news of our industry

Mack Ups Diesel Truck Sales

Mack Trucks, Inc. reported recently that it led all other United States manufacturers in volume of diesel truck sales in 1953 and increased its sales over 1952 in face of a lower total for the industry. The company based the report on statistics compiled by the Automobile Manufacturers Assn.

All Mack sales were in Group VII, the category of vehicles of 26,000 lb GVW and over, and the company announced that it had 25.7 per cent of the total domestic sales of diesel-powered trucks and truck-tractors in 1953. E. D. Bransome, chairman of the board and president of the company, attributed the improved diesel sales to fuel-economy records attained by the new Mack Thermodyne diesel engine.

Baldwin Locomotives to Mexico

On their way to the National Railways of Mexico are twenty Baldwin-Westinghouse diesel-electric locomotives. Built in the Eddystone shops of Baldwin-Lima-Hamilton Corp., the Model AS-616, 1600-hp locomotives feature the latest 6-wheel, 3-motor, cast steel truck design, roller bearing journals, dynamic braking, and multiple unit control.

The AS-616's are powered by Baldwin 8-cyl, supercharged diesel engines capable of delivering 1750 hp (gross) at 625 rpm, at elevations up to 8000 ft above sea level, which is of special importance in the mountainous terrain of Mexico. The locomotives weigh about 358,000 lb each and have starting tractive efforts of 89,500 lb at 25 per cent adhesion.

Magdalen Islands Electrified

Electricity has come to the windswept Isles de Madeleine, that stretch 60 miles in the Gulf of St. Lawrence, southwest of Newfoundland.

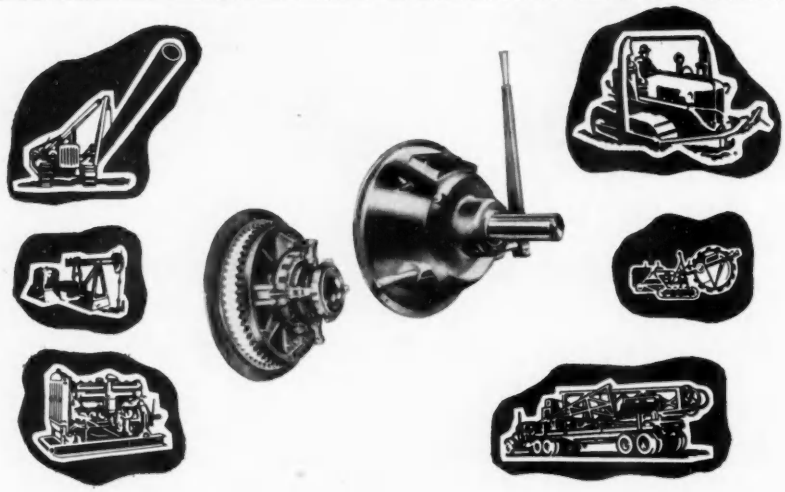
Previously the only electricity the French-speaking Madelinots had was at their hospital and a few fish plants supplied by their own generators. Now diesel engines at the electric cooperative in Grindstone supply most of the 9200 inhabitants with light for their homes and power for their radio sets.

Diesels were needed for the generators because there is no water power in the low, treeless islands. Electrification is estimated to have cost $500,000, 25 per cent paid by the islanders and the balance by Quebec. Winter's ice still stops steamers touching there, but now there is a regular all-year air service, long-distance telephone service, and a wireless station. A new highway built since the war enables automobile travel and a bus service links most of the islands.

CNR Extends Dieselization

The Canadian National Railways announces it will continue its dieselization program in the Maritimes this year, extending diesels to the Halifax-Montreal passenger service, and putting them on more freight runs in the Atlantic region.

Donald Gordon, president of the line, disclosed that 33 new diesel locomotives have been ordered for Atlantic region service: 12 for passengers, 14 for freights, and 7 for yard switchers.



To Make SURE That YOUR CLUTCH Application Is RIGHT

Before you approve the blueprint for your next model — double check to make sure it includes the latest improvements you can build into your product with the right type and size ROCKFORD CLUTCH. It will pay you to consult our engineers concerning technical clutch advances that will give you and your customers the advantages of better power transmission control.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER-TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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ROCKFORD CLUTCHES

new literature

Industrial Washers

Sixteen pages of information and pictures on the manufacture and availability of metal and fiber washers, both standard and special, are contained in a booklet issued by H. K. Metal Craft Mfg. Co., 3775 Tenth Ave., New York 34, N.Y. Included are data on general washer characteristics, tolerances, and company facilities for meeting individual requirements. Standard washers carried in stock are listed, and existing die sizes for production of more than 30,000 types and sizes are given.

Rubberized Abrasives

A treatise on the adaptability and application of rubberized abrasives, together with complete specifications, is contained in a new illustrated catalog, No. 53, issued by Cratex Mfg. Co., 81 Natoma St., San Francisco 5, Cal.

The abrasives are designed for burring, smoothing, and polishing operations after dimensional grinding and shaping. They are available in wheels, points, blocks, sticks and cones for machine or hand operations. Features of the catalog are information on four standard grit types ranging from relatively coarse to extremely fine textures and detailed applications of each type for desired result on hard or soft metals and materials.

Oxidation of Lubricants

Ways of detecting chemical changes that occur during oxidation of lubricating oils and greases are described in a 2-volume report made public by the U.S. Department of Commerce, "The Detection and Determination of Oxidation Products in Lubricants", available from Library of Congress, Publication Board Project, Washington 25, D.C.

Where lubricants must last the life of an instrument, both physical and chemical properties of the lubricant must remain unchanged over a long period. The infrared and mass spectrometric techniques described in the report are designed to reveal the end products of oxidation, providing a basis for comparative evaluation of the stability of lubricants.

Featured is a complete description with detailed drawings of the construction and operational features of a lab-constructed mass spectrometer for handling oxygenated hydrocarbon compounds, including instructions on how to use the instrument to analyze fractions obtained from lubricating oil oxidation. A simplified per cent transmission computer and a simple oil oxidation apparatus were also developed, the computer permitting more rapid interpretation of infrared spectral data than formerly possible.

Vol. I of the report also contains comprehensive literature review, including bibliographies, for both chemical and physical methods of analysis. Vol. II described how oxygenated hydrocarbon compounds were collected and purified prior to actual analysis. Much infrared data in the form of pure compound spectra is presented and a tentative qualitative and quantitative scheme of analysis developed by use of the two techniques described. From this data, a tentative procedure for evaluating lubricating oils is devised and carried through for a typical oil.

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with CHROMATES

Mutual's Chromates are widely used throughout industry to inhibit corrosion. In the diesel field, they are used advantageously in the water cooling systems of locomotive, marine and stationary diesels — in closed engine jackets, open towers and evaporative condensers. Chromates are particularly effective in combatting corrosion of engine cylinder liners.

Mutual is the oldest and largest manufacturer of Chromium Chemicals. Our technical staff will be glad to advise you on the application of Chromates in your corrosion problems.

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HAS HAD IT FOR 15 YEARS!

Here's the full-flow filter that's packed with LABOR and TIME SAVING FEATURES! All steel, seamless, light weight tanks.

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UP TO 25 GPM PER CARTRIDGE with EXTREMELY LOW PRESSURE DROP . . .

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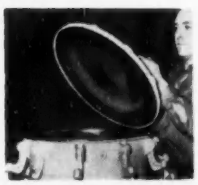
HIGHEST WORKING PRESSURES

NO TOOLS NEEDED

"Exclusive BRIGGS EASI-LIFT COVER"



. . . and there's a Briggs patented DISC-PAC throw-away cartridge to go with this "all-convenience" filter case. The combination will give you more oil and engine protection than competitive material.

IF IT'S THE PEAK IN DIRT TRAPPING and holding that you want . . . if you want to filter out those micronic sized abrasives . . . and give complete protection to your engine . . . then by all means get the latest information on what genuine Full Flow results can mean to you.

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Please send me data sheet on Briggs filter cartridges and your D and H series filter cases.
No obligation, of course!
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new products

Silicones to Reduce Vibration

New silicones, designated Viscasil fluids, said to be versatile enough to resist high temperatures and mechanical shear breakdown in automotive vibration dampers, as well as to substantially increase water repellency in pharmaceutical preparations, have just been made commercially available by the General Electric Co.'s Silicone Products Dept., Waterford, N. Y.

Company engineers state that the silicones will pour more freely at temperature extremes than any other fluids known today. They are stable, they said, even when exposed to 300°F heat for thousands of hours. Dr. C. E. Reed, general manager of the department, predicted that the fluids will find use in fluid couplings, shock absorbers, and similar mechanical applications.

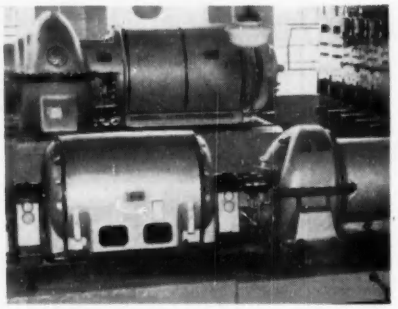
The multi-purpose fluids may also be utilized as release agents; they are claimed capable of preventing adhesion of rubber and resins to molds and of releasing ice from rubber and metals. On automotive equipment, Dr. Reed said, they will permit simpler design, wider tolerance, and improved reliability.

New Snubber Series Developed

A new and improved snubber series, designed for more effective control of engine noise, with construction design to meet demand for greater safety, has been announced by Burgess-Manning Co., 749 Park Ave., Libertyville, Ill.

Designated BEO (for optimum service), BES (for standard service), and BEC (for commercial service), the series includes a total of 10 models. They are ruggedly built with heavy gauge steel shells, internally reinforced construction, flange dome-type heads, and gusset connections.

Series BEO replaces and supplements STC snubbers, pipe sizes 8 in and larger; series BES replaces SDG and ADL snubbers, pipe sizes 8 in and larger. Series BEC has no previous equivalent and is said to be highly effective for supercharged engine exhausts.



Give your equipment that NEW LOOK

SPRUCE up your diesels, generators, other heavy equipment by giving them a quick rub-down with Oakite Renovator.

Oakite Renovator, solvent-emulsion type cleaner, is easy to apply by cloth or sponge. Goes after grime, oil, soot, other surface dirt in a hurry. No rinse necessary — just polish with a dry-cloth to bring out high paint luster. Completely safe on painted surfaces, Oakite Renovator presents no fire hazard because its solutions are water-mixed.

Ask your local Oakite Technical Service Representative for free on-the-spot demonstration. Or write for new "Power Plant Cleaning" Booklet. FREE!

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organizational news

EMD Elevations

Three promotions have been announced in the Electro-Motive Div. of General Motors Corp. W. P. Durbin is the new advertising manager; William H. Harvey has taken on the newly created post of coordinator of new products; and Eugene X. Humphrey is now director of industrial relations.

W. P. Durbin

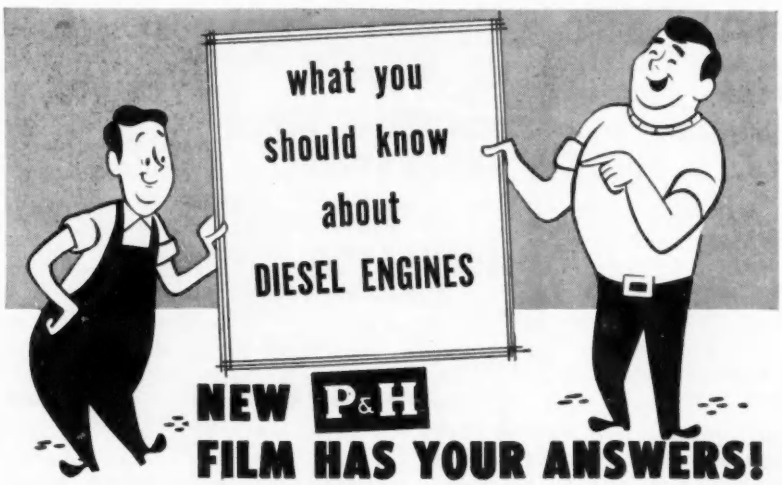
W. H. Harvey

E. X. Humphrey

Mr. Durbin, assistant advertising manager since 1950, joined the Remy Electric Div. of GM as a draftsman in 1924. In 1925, he transferred to the Link-Belt Co. and re-joined GM in 1937 as an engineering estimator for EMD. He became a supervisor in the planning department and in 1938, was shifted to the service department as supervisor of repair and rebuild costs. In 1944, he joined the purchasing department and in 1949, became administrative assistant to the director of production control and purchasing.

Mr. Harvey started his career at Jones Laughlin Steel Corp. in 1937 and joined EMD in 1947 as director of industrial relations, which position he held until his present appointment.

Mr. Humphrey worked with the FBI and the Stevens Hotel before entering the division in 1942 in labor relations work. He became supervisor of labor relations in 1943 and director the same year.



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★ FLEXIBLE HOSE ASSEMBLIES

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news of our industry

Frisco Dieselizes Cranes

The old fire-eating, steam-powered locomotive cranes are fast becoming a thing of the past on the lines of the St. Louis-San Francisco Railway Co. (Frisco). Although the road had switched to diesel on its locomotives, Frisco officials had to do some thinking about converting the cranes as well. Deciding to put the idea to a test, they repowered one of their Browning 30-ton locomotive cranes. A Caterpillar D318 diesel engine was ordered for the trial.

Sufficient power was needed not only to replace the reversing steam engine, but also to drive the independent swing. A special arrangement of gears and clutches was made to bridge the power gap and swing rpm was increased approximately 50 per cent. The engine was equipped with a torque converter to drive the swing and a jackshaft was included to furnish power to two swing clutches mounted on a steel base.

Twin Disc clutches were coupled to a bevel gear arrangement to give right angle drive power to the existing swing gear arrangement. For power train to the main crane crankshaft, a chain and sprocket arrangement was installed connecting the torque converter output shaft to the main crankshaft. Arrangement of engine consisted of an engine-torque converter package with air compressor, and a gasoline starting engine.

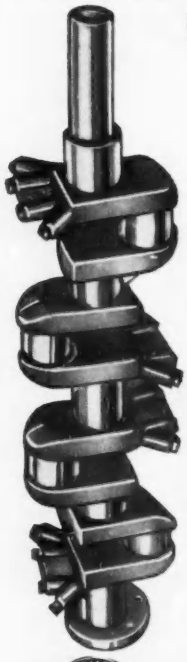
The crane was cleaned, cab was sandblasted and rebuilt. A 100-gal fuel tank was placed beneath the engine base and ballast was added. A single lever system for throttle, clutch and reverse gear was installed.

Pleased with the performance of the first diesel-powered crane, the railway is now repowering two more locomotive cranes and has ordered an additional two converted. Eventual repowering of 20 more are planned. Most of these are in the 30-ton class and a few are 100-ton and 160-ton. Frisco estimates they are saving $1 per working hour on fuel alone. One hundred per cent availability is another stated advantage.

New Method of Producing MoS_2

Need for high heat-resistant materials has lately stimulated interest in refractory metals such as tungsten and molybdenum. At present, molybdenum is being produced as a fine powder by reducing purified molybdic oxide with hydrogen, an expensive process which does not permit control of particle size. Extensive purification is required and to fabricate the powder into molybdenum objects, complicated powder-metallurgy procedures are necessary.

A flexible process of electrolytically depositing molybdenum has just been achieved by the National Bureau of Standards. More rapid, less expensive methods for producing parts and coatings and for extracting the metal from the ore are now said to be possible. The method permits deposits directly on the cathode in the desired physical form and in a very pure state. Applications of the method for electroforming, which is now under study, would make possible the formation of molybdenum parts having complicated shapes.



CRANKSHAFTS REBUILT

Hard Chrome Surfaced for Longer Life!

Hard Chrome deposited on shaft by "Rotary Process" assures even deposit.

Shafts Electro Heat Treated 3 times.

All shafts carefully magna-fluxed to detect hidden defects.

Experienced Workmen — Specially Designed Machinery — Careful Inspection, guarantee each job.

CAPACITY
10" Stroke
24" Swing
96" Length

Write for complete information and prices.

AUTOMOTIVE ENGINE REBUILDERS ASSOCIATION

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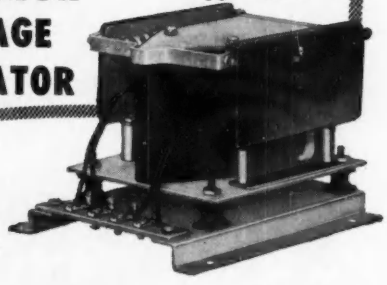
8816 HARKNESS RD., CLEVELAND 6, OHIO
Serving the Nation's Largest Fleets

Burlington

TYPE WA
Formerly Ward-Leonard Type 5660

GENERATOR VOLTAGE REGULATOR



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Designed for use in regulating the voltage of A.C. generators for Stationary, Mobile or Marine installations. Direct rheostatic action provides a simple, effective and automatic means of regulating voltage by performing the function of an automatic field rheostat.

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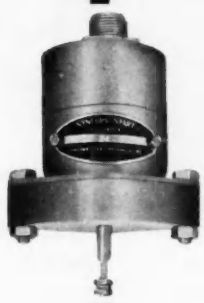

Synchro-Start MODEL SS-A Solenoid has been developed to meet the demands of many customers requiring a standard aircraft type fitting.

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new literature

Industrial Water Treatment

To explain variations in water treatment processes, how they work, the equipment they require, and the type of water they produce, Rohm & Hass Co., Washington Sq., Philadelphia 5, Pa., has compiled a 24-page booklet entitled "If You Use Water".

Illustrated with 2-color flow diagrams, the booklet discusses the fundamentals of the three major classifications of industrial water treatment based on ion exchange: softening, dealkalization, and deionization, and presents the major process variations under each classification. The advantages of the various methods are discussed and interpreted in terms of applications in specific industries.

Liquid-Level Extraction

A new bulletin illustrating and describing its liquid-level centrifugal extractor, the Super Centactor, has been published by The Sharples Corp., Research Laboratories, 424 W. 4 St., Bridgeport, Pa.

The bulletin describes the principle of operation and functioning of the extractor, and lists advantages of the new device. A complete pilot plant incorporating the device is also detailed.

Thermistor Manual

A new manual to enable easy understanding of Thermistors, their application and functions, and the benefits industry can derive from them in detecting and compensating temperatures and providing time delay or surge control in electrical equipment, is announced by the Carboloy Dept. of General Electric Co., Detroit 32, Mich.

The 52-page publication, TH-13, includes new information, tests, and static volt-ampere and dynamic characteristic curves. Background information is supplied along with explanations of the source and utility of the data and the curves. Illustrations are keyed to style and type best adapted to each application.

Construction Brochure

"9 Profitable Minutes for Contractors" is the title of an illustrated booklet published by Hyster Co., 2902 N.E. Clackamas St., Portland 8, Ore., to show contractors how they can increase productivity of tractors by adding attachments. Cost and time-saving ideas taken from case studies are contained. Action photos show tractors and attachments working in a variety of construction operations.

Leasing of Industrial Equipment

Much attention has been given recently to the possible advantages offered industry through leasing of capital equipment as compared with outright purchase. The Council for Technological Advancement, 120 S. La Salle St., Chicago 3, Ill., has undertaken a study of the factors involved.

As an interim report, the Council has published a study detailing practical considerations, analysis of terms and conditions of lease agreements, financing, legal and tax problems, and the anti-trust law. Advantages and disadvantages to the lessor, lessee, and public are discussed.

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news of our industry

Better Tool Cuts Cutting Time

Reducing machining costs does not always mean making a job analysis of the operation. According to the Carboloy Dept. of General Electric Co., costs may sometimes be decreased by simply using a better cutting tool.

For example, at the Lynn River works of GE, the shift to a new cutting tool in machining jet engine turbine wheel shafts did four things. It eliminated use of a special spring-loaded quill that cost $1500, stopped the heat-treated steel forging from elongating, increased tool life by 40 per cent, and reduced tool grinding time 50 per cent.

The job consisted of machining the engine part on a lathe without coolants. Normal operation called for first turning the forging and then repeating the operation with a finishing cut. Two cemented carbide cutting tools were used to complete the job, one for roughing the other for finishing. The carbides ran at red heat and heat generated by the cutting action caused the shaft to elongate and caused ball bearings centered in the quill to seize. Tool breakage was also heavy, about 5 to 6 per week. A special spring-loaded quill was devised to keep the work from freezing on center.

The whole task is now completed with one cemented carbide tool, grade 370, recently developed by the Carboloy Dept. Both red heat and shaft elongation are no longer problems and it is not necessary to depend on the special quill to keep product quality up to specifications. The tool used includes a chip breaker and operates at a speed of 200 sfpm. It is said to be running three times as long as former carbides used, without tip deformation, although it is used for both roughing and grinding. Only regrinding it requires is a slight touch up from time to time rather than a full grind.

Industrial Research

Armour Research Foundation of Illinois Institute of Technology announces that it performed more than $10 million worth of research for industry and government during 1953, an increase of 25 per cent over the 1952 figure. This best year in the 17-year old non-profit organization's history saw the expansion of its computer center, which now ranks as one of the best equipped in the Midwest. The center solves complex problems in heat transfer, engine vibration, engine valve studies, servo analysis and the like.

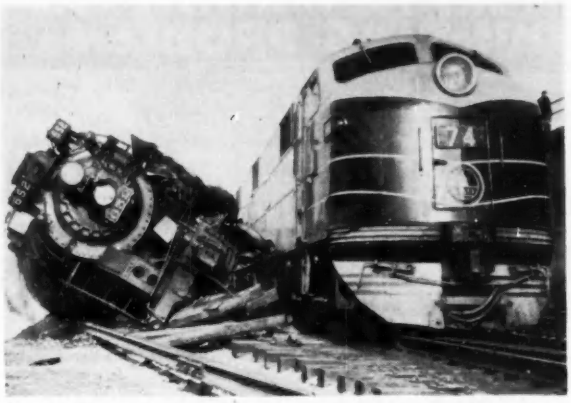
In the field of engines and lubricants, the group cooperated with the Harnischfeger Corp. to evaluate endurance characteristics of its 6-cyl diesel and to determine location and development of lubricating and fuel oil leaks in the 3-cyl P&H diesel. The 6-cyl engine has been operated for about 800 hr at 1800 rpm and 150 hp, to date. The 3-cyl engine ran 600 hours at various speeds and loads with engine data noted and recorded each hour. Results were design changes eliminating leaks.

For Fairbanks, Morse & Co., a dynamic flow technique was developed to study the scavenging air flow pattern inside an engine cylinder. With aid of high-speed photography and a tracing medium in the scavenging air, flow pattern in various planes within a transparent model of the cylinder was photographed. Qualitative data on purging efficiency of the engine port design was obtained.

To evaluate lubrication oils for marine diesels, a program was initiated under sponsorship of the Bureau of Ships. Studies have been completed using GM 3-71 and Caterpillar 1-A engines with lube oils of Class A and B. Current tests are for securing data for test parameters, studying effect of fuel and operating variables, and rating procedures.

IEC to Meet in Philadelphia

Seven hundred electrical technical experts, 300 of them from foreign countries, will attend the fiftieth anniversary meeting of the International Electrotechnical Commission which will be held on the campus of the University of Pennsylvania in Philadelphia, September 1 to 6. U. S. participation in the group is being carried on by the American Standards Assn.



Survival of the Fittest, Steam Yields to Diesel

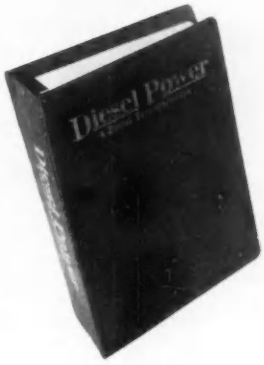
At a cross-over, two miles east of Cleveland, these two met—a Baltimore & Ohio diesel-powered passenger train and a Nickel Plate freight towed by a steam engine. Result was the derailing of both. However, the diesel remained upright, while the steamer was forced over on its side. The diesel locomotive was pulling seven cars carrying 200 passengers. No one was hurt.

American Bosch Reaches 50 Thousandth PSB Pump

American Bosch Corp. announces that it has passed the 50,000 mark in production of its PSB distributor-type, single-plunger fuel injection pump which was introduced to the industry several years ago. The pump was developed by the company to fill the need for a simplified lower cost injection system. Small in size, with about half as many parts as the standard multi-cylinder pump, the PSB uses a single plunger and delivery valve to serve all engine cylinders.

Earlier studies by the company had revealed this possibility in place of the customary use of a pumping element and valve for each cylinder. After the war, American Bosch spent over a million dollars in research, which has made possible the production of small and more economically priced engines with all the advantages of a precision-built injection system. The farm tractor here and abroad has benefited from this, as well as electric generating sets and marine and industrial engines. The company states that it has several new designs now undergoing tests in its laboratories.

Diesel Power Binder



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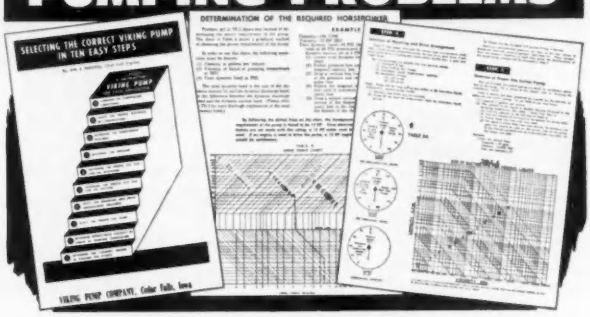

"Selecting the Correct Viking Pump in Ten Easy Steps," is a ten-page booklet designed to help engineers in choosing the right Viking Pump for each application. This folder is free upon request.

If you would like to have one or more copies, write today for Bulletin TS-6D.

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new products

Rear Engine Support Mounting

A new center-bonded mounting, J-5327-2, for isolating engine vibration from the vehicle body has been announced by Lord Mfg. Co., 1635 W. 12 St., Erie, Pa. The mounting, designed primarily for use on automotive engines, is of 200-lb to 300-lb normal load capacity.

The new mounting is said to provide performance at a lower cost, equal to or better than full-bonded mounting. Easier installation, improved service life, and lower service and maintenance costs are also claimed. At assembly, when mounting is installed in its bracket, the rubber is compressed. Tolerances of "as-cast" sockets are said to be no problem, and permanent seating of the mounting in the socket provides for rebound loads of over 500 lb.

Intake Air Filter

American Air Filter Co., Inc., Louisville 8, Ky., announces production of Type FS intake air filter for small portable or stationary engines and compressors. Filtering medium is rayon flocked screen wire, accordion pleated and arranged in cylindrical form.

The rayon flock is held on the 14-mesh galvanized screen wire with a thermoplastic bond said to be impervious to solvents, permitting a wide choice of cleaning methods. The filter may be operated either dry or oil coated, and when oiled its dust-holding capacity is comparable to that of a viscous-type filter. An inner perforated screen baffle serves to equalize the air flow and protect against backfire.

The air filter is made in seven sizes, giving a range from 50 to 300 cfm.

A weather shield is available for outdoor installation. Complete information may be obtained by asking for Bulletin No. 135.

Electro Proximity Pick-Up

Development of a new proximity pick-up impulse generator, Model 4900, is announced by Electro Products Laboratories, Inc., 4501 N. Ravenswood Ave., Chicago 40, Ill., as a low-speed complement to its Model 3010A. As a high frequency carrier-operated transducer, it works on a principle similar to the mine detector and may be excited either by magnetic or non-magnetic metals.

The new system consists of a transducer connected by a 10-ft cable to a control unit containing the power supply and other electronic components. A DC voltage of constant amplitude is produced when any metallic mass is brought near the pickup.

No mechanical contact is made with the exciting metal. The unit may be used either portably or permanently mounted.

new literature

Flow Control Valves

Standard and custom-built flow control valves for industrial applications are illustrated in a new 4-page catalog, "Solve These Flow Control Problems", by A-P Controls Corp., 2450 N. 32 St., Milwaukee 45, Wis.

Descriptions include capacity ranges, connection and orifice sizes, lift, etc., for each control illustrated. A summary of solenoids, expansion, evaporator pressure, water regulating, filter, drier, check, oil flow, and thermatic gas controls describes the manufacturer's custom engineering services available.

Ampco Metal Machining

Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis., has issued a revised 12-page bulletin on the machining of the various grades of its metal, a bronze alloy, for cutting tools.

General machining properties are first considered, with comparative grade ratings. Machining practices are next detailed for the various grades including cutoff and forming tools, coolants, speeds and finishes, grinding, honing and polishing, milling, broaching, sawing, drilling, reaming and tapping. Tool design and inspection are also discussed. Various manufacturers have contributed to the data contained.

Temperature Indicators

An 8-page bulletin, A-303, has been issued by The Foxboro Co., Foxboro, Mass., describing two portable temperature indicators, the Potentiometer and the resistance thermometer—instruments used for periodic temperature tests to spot impending trouble in equipment which may not warrant continuous measurement.

Operating adjustments, features of design, test circuits, measuring elements and instrument specifications are included along with standard scales available. Tables also list the type of thermocouple or resistance bulb recommended for each range as well as degrees of temperature indicated by each scale division.

Silent Chain Drives

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has issued an 88-page book on silent chains containing detailed engineering data.

Pre-engineered stock drives for normal requirements are listed in a 16-page section. A 22-page section outlines procedure for selection of completely engineered drives and includes an indexed table of service factors, rating tables, and chain length and center distance computations. Other sections are devoted to drive components and accessories. Complete operational and technical data such as installation, maintenance, and lubrication procedures, are described in the final section.

Weldless Rolled Rings

Ways of improving product design through use of weldless rolled rings are discussed in a folder just released by Ladish Co., Cudahy, Wis. Rings in sizes up to 240 in. and in weights up to 40,000 lb. are described and illustrated. Advantages are presented along with typical applications.

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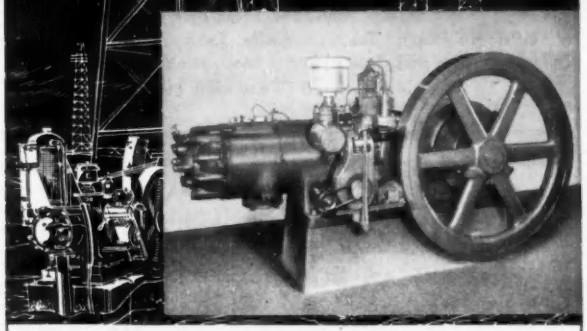

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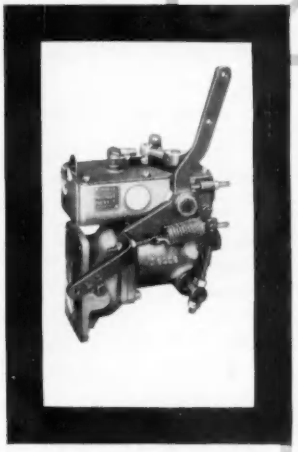

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news of our industry

Vanasil Pistons Stocked

Establishment of four warehouse stocks has been announced by Gillet & Eaton, Inc., manufacturers of Vanasil pistons. Stocks will include more than 60 sizes and types for replacement needs. The stocks will be located in Oakland, Cal.; Denver, Col.; Jacksonville, Fla.; and New York City.

The pistons are made from a patented vanadium-silicon-aluminum alloy which is said to be 30 per cent harder than other alloys and to have 30 per cent less friction. Porous texture of the alloy is claimed to minimize scoring and scuffing. Ring groove wear is also reportedly minimized, as much as 75 per cent, to virtually eliminate top ring breakage, and the manufacturer states that the pistons can be fitted with close cast iron clearances, with no tin or other break-in coating required.

Diesel Engines in Agriculture

The March issue of *Gas & Oil Power*, British engineering magazine, devotes its lead editorial to a discussion of diesel engines in farming.

The publication estimates that in 1952, only 6 per cent of British tractors were diesel-driven. By the end of 1953, well over 50 per cent of all new tractors supplied to the English market were diesel powered and according to the publication, a recent statement from English Ford indicates that the demand is now almost wholly for diesel tractors.

Quoting from a paper written by two Ford engineers, the magazine emphasizes the economical aspect of the diesel. Test results for 22 of the latest diesel and vaporizing oil tractors tested show that the average full-load fuel consumption of the diesel is two-thirds that of the vaporizing oil type. At half load, it is one-half. Considering that a tractor is operated at varying loads, it is stated that fuel consumption of a diesel is fairly about 60 per cent of the other type. This is supported by records taken on different farms.

In England a diesel tractor still costs about 20 per cent more than the vaporizing oil unit. The question of this first cost must be taken into account when considering fuel economy and usage. The authors of the paper indicated that no less than one-fifth of the cost is accounted for by the fuel injection equipment.

One speaker discussing the paper spoke hopefully about developments in America with simple distributor-type fuel pumps which may lead to a real reduction in initial cost. The magazine itself stressed, "The important fact is that the diesel tractor might well prove to the farmer in the immediate future what it is already proving to the London taxi owner; it represents the difference between profit and loss, although tractor operation is not by any stretch of the imagination the only factor in farming economics."

The editors then consider the factor of fuel cleanliness, which they state, the farmer is not very conscious of. It is a human problem, "which, if it can be solved, will do much to make the diesel engine an even more attractive proposition . . . " Because of precision engineering going into the diesel, "with really clean fuel, they would function for many thousands of hours with little or no wear or servicing troubles".

"Total enclosure of parts so as to prevent tinkering and to encourage cleaning, automatically-cleaned filters, sump-emptying arrangements which positively encourage their use, even larger oilbath air cleaners, and possibly air-cooled engines may figure in future tractor diesel specifications."

National Supply Ups 65 Rating

The Engine Div. of the National Supply Co. has announced that its Superior Model 65 supercharged 6- and 8-cyl stationary diesel engines are now available with output ratings of 1325 bhp and 1765 bhp respectively. Higher ratings are result of a change in supercharging, raising the bmep to 152 psi.

news of our industry

Discuss Diesel at AIEE Meet

At land transportation sessions of the northeastern district meeting of the American Institute of Electrical Engineers, engineers of the General Electric Co. described three recent devices developed for the diesel-electric locomotive.

Temperature Control

A new engine temperature control was reported by E. F. Weiser. Locomotives encounter ambient temperatures ranging from 120°F to —40°F among other factors, such as dust, sand, sleet, snow, and altitudes up to 10,000 ft, Mr. Weiser explained. "Engine designers require accurate and dependable control of an optimum temperature as a basis for design. . . . dependability, simplicity and long life are basic to economical service."

The system developed for this service consists of a fan slip clutch operating off the fan shaft which is controlled by revolutions of the engine, plus shutter actuators and a temperature control device. Basically the device is a single lever moved by means of a thermostat to operate a multi-finger rheostat in series with the clutch coil and voltage supply. Shutter air cylinders are supplied from a common air line controlled by a conventional magnet drive. Excitation is supplied from a tap on the clutch rheostat.

Static Excitation System

The use of packaged easily serviced static equipment for greater reliability in control of locomotives was reported by S. W. McElhenny and R. M. Smith. The static excitation system consists of an alternator-rectifier combination with an amplistat (magnetic rectifier). It was described as a "closed loop feed-back scheme which can be made to hold present limits to a high degree of accuracy".

The control is said to eliminate use of DC commutator machines in the traction excitation circuits, with the alternators replacing them requiring much less maintenance. The following limits on the generator-motor are imposed: a variable, controlled generator armature control limit; a maximum diesel engine hp limit; and a maximum generator ceiling voltage limit.

Armature generator current must be controlled to prevent high driving wheel-rail adhesion with danger of drawbar fracture, or low adhesion, causing slipping wheels. As speed increases, the motors make increased demand on the engine, representing more hp demand and more fuel demand. Since there is a limit to amount of fuel which can be safely fed to the engine, a control device is needed to match electrical demands to the maximum hp the engine is capable of delivering. Ceiling voltage limit is needed to limit maximum generator field heating and maximum generator voltage for protection of the equipment and not directly for control of the locomotive.

Diesel-Electric Motor

M. J. Baldwin described a new electric motor which he indicated may prove a factor in promoting worldwide rapid spread of dieselization. The motor weighs 4250 lb compared to 7850 lb for the standard motor used in this country and is for use on standard or less than

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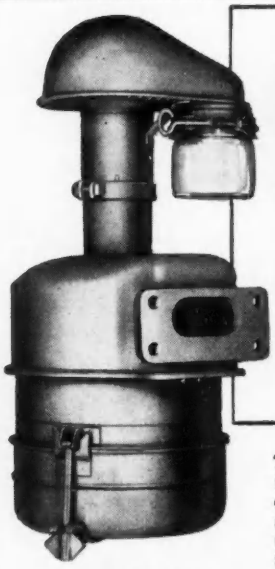

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(Continued from page 78)

standard gauge railroads. Maximum axle weight is 44,000 lb, compared to 70,000 lb for standard domestic motors and 50,000 lb for the double traction motor which is used on less than standard gauge railroads.

The motor was designed to meet the needs of a large percentage of foreign roads. There are several reasons for a smaller motor, Mr. Baldwin said. Lightweight rails are frequently economically necessary. Bridge structures are also generally lighter. He pointed out that dieselization throughout the world is about where it was in this country 10 years ago.

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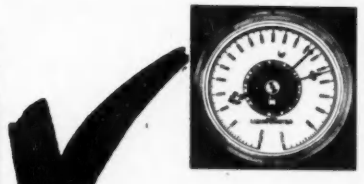

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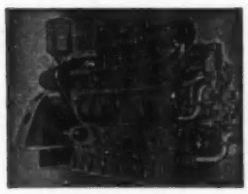

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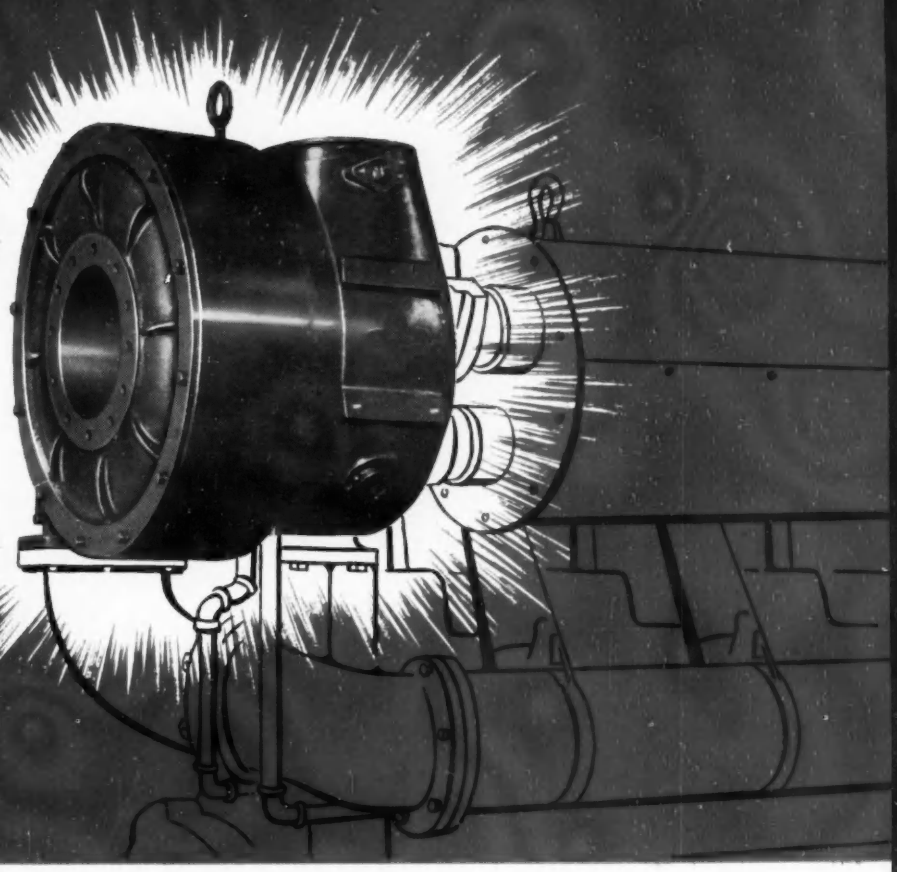

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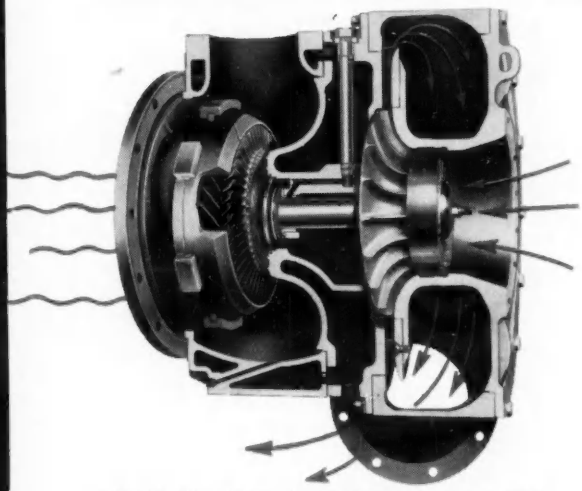

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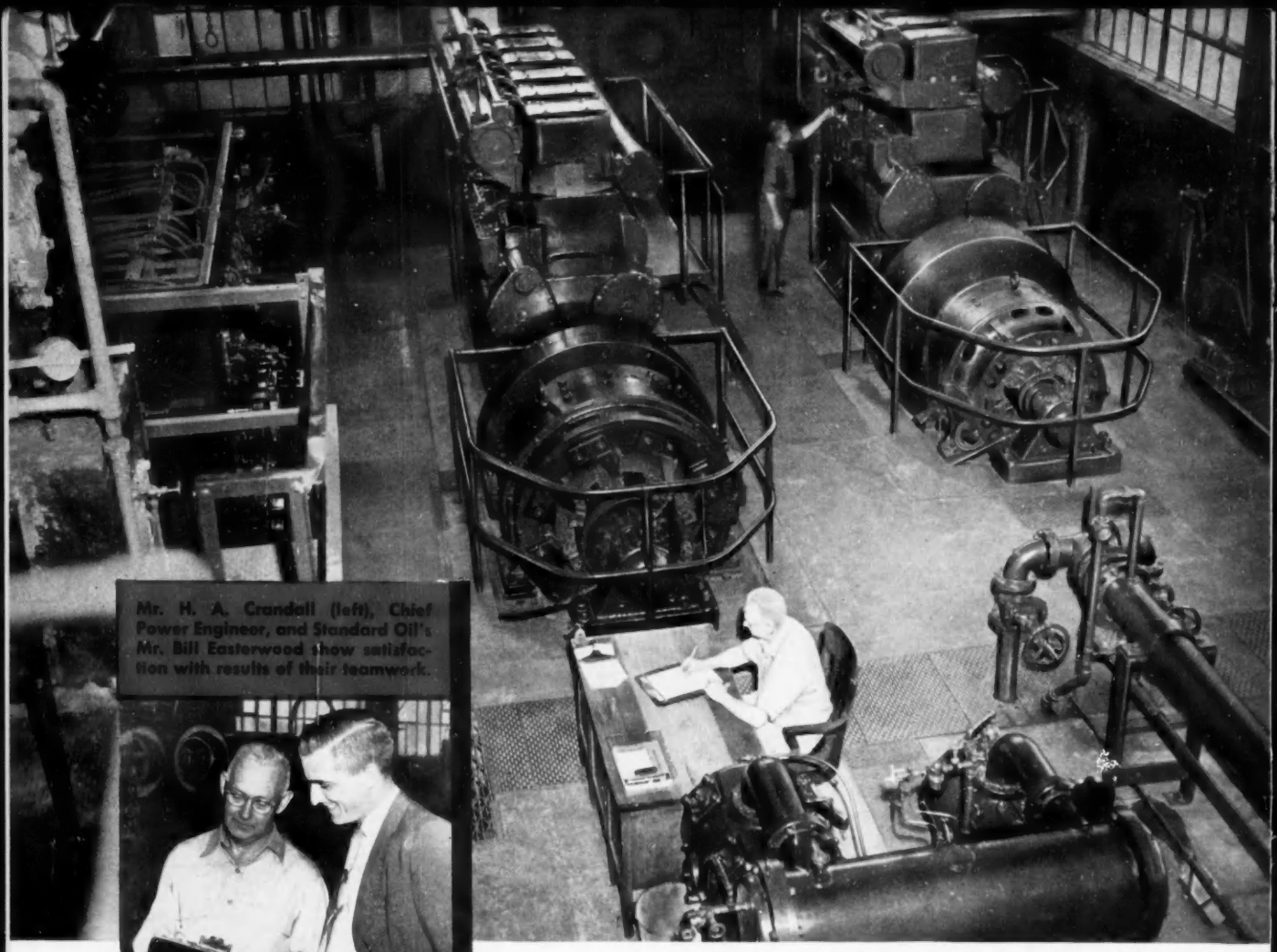

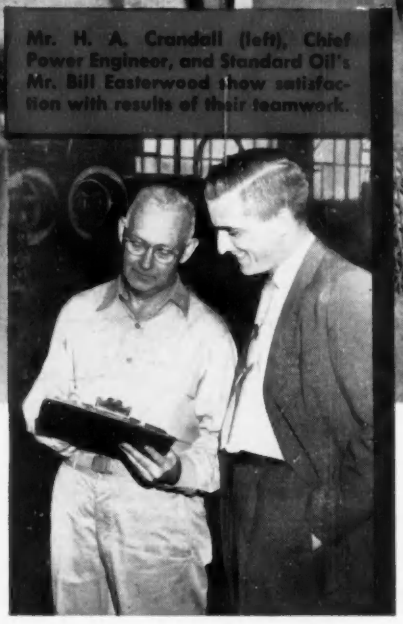

Mr. H. A. Crandall (left), Chief Power Engineer, and Standard Oil's Mr. Bill Easterwood show satisfaction with results of their teamwork.

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